The Earth Science DIGEST

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IN THIS ISSUE

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LOST BLACK MAVERICK

by Victor Shaw

This story differs from the usual lost-mine tales, for it was twice lost. It records the discovery in rather recent years of a lost old Spanish gold mine by a young Yaqui Indian, that was lost again owing to an ancient Indian tradition, that barred them under a death penalty from leading white men to any hidden gold deposit. Yet this tale seems authentic, as the Indian was well known to a cattle man, still living and known to this writer, who saw his gold ore.

Oddly this young Indian, known as "Yaqui Valentino," was a rope-wise working cowboy, who when making his discovery was mounted while brush-popping mavericks in the Four Peaks region, some thirty-five miles northeast of Phoenix, Arizona. Four Peaks is a mountain of about 7,600-ft. elevation at the south end of Mazatzal Range, that runs north from Salt River almost to the Tonto National Bridge.

(Incidentally the writer has twice been to this mountain to study its geology, and knows it to be favorable for gold deposits.)

Now one summer day less than fifty years ago, Yaqui Valentino was riding his pony through the scrub oak and chapparal thickets, that cover the western flanks of this mountain, hunting for any stray mavericks, which are unbranded calves or yearlings. The brush was very high and dense, and snaking his pony through it he suddenly heard some huge animal crashing on ahead, then saw that it was a black bull, young and unbranded. Coiling his riata, he gave chase and began hazing the dodging critter gradually toward an open area ahead, where there was a fair chance to rope it. A tough job in the chapparal for the bull was fast and tricky, probably a descendant of the black stock brought from Spain far back in Coronardo's time.

At any rate, the bull had nothing on Yaqui Valentino, whose experience aided in checking every move to soon work the bull out into the open; where he made his cast, flopped the bull neatly, dallied his rope and followed it down to hog-tie the struggling brute with piggin-strings. Then building a small fire of grease wood to heat his iron, he clamped on the brand of the stockman for whom he worked.

When released, the bull rolled over and while frantically trying to regain its feet thrust its hind legs down through the sandy ground; but lashed by the rope hondo, managed to paw its way out and crash crazily off into the nearby chapparal. The Yaqui watched it go, then filled with curiosity examined the broken ground surface, where the animal's hind legs had gone through. There was a deep hole and a bit of work disclosed a lining of old timbers dry-rotted obviously by countless years of blasting desert sun.

And it was when stepping deftly back from the sand slipping into that black pit, that he caught a sun-flash from a chunk of rock that laid half buried in sand, where the bull pawed to free himself. Picking it up, he saw it was a piece of milky quartz and the pawing hoofs had scraped it clean, to expose glittering wires and solid masses of yellow gold all over it. In fact, it seemed to be half gold.

A long while he stared, turning it over and over, before he thrust it into a pocket and looked for more. But all he found was a few rust-eaten drills and part of an ancient Spanish or Mexican pick nearly rusted away. And off back of the old shaft mostly covered by sand were the dry-rotted foundation logs of a small shack. So this, he concluded, must have been an old mining shaft sunk on a gold vein that was unknown to anyone but himself. If only he knew how to mine the gold ore, he would be the rich-

(Continued on Page 28)

In Memoriam

DR. BETHEL J. BABBITT
Late Editor—*Earth Science Digest*

Not till the loom is silent
And the shuttles cease to fly,
Shall God unroll the canvas
And explain the reason why
The dark threads are as needful,
In the weaver's skillful hand,
As the threads of gold and silver
In the pattern He has planned.
Anonymous

— BETHEL J. BABBITT —

1894 — 1953

Word of the very sudden and untimely passing of Dr. Bethel J. Babbitt, able editor of *Earth Science Digest,* early on the morning of August 8th, 1953, came as a great shock to all of his friends and associates. Apparently in his usual health, Dr. Babbitt had spent the preceding evening with friends, pleasantly and in jovial mood.

Dr. Babbitt,—B. J. as he was affectionately known to his friends, resided with his wife Mildred, at 140 Northgate Road, in Riverside, Illinois, and is survived by three married daughters, Mrs. June Caliga, Mrs. Mary Thomas, and Mrs. Lucile Williams. Also by one sister and four brothers. His only son Richard was a casualty of World War II.

He was born in Rushford, New York, and received his B.S. degree from Oberlin College, and later his Ph.D. from the University of Michigan, where for a time he taught Physics. Later he was employed as a physicist by the U. S. Bureau of Standards, in Washington, D. C.

At the time of his death he was a Supervisor of Product Engineering at the Hawthorne Plant of the Western Electric Company, where he had been employed for nearly thirty years. He was recognized as a foremost authority on the piezo-electric properties of quartz crystals, and had recently given a most instructive lecture upon the subject before the members of the Earth Science Club of Northern Illinois, of which organization he was a founder, director, and editor of the Club Bulletin, the ESCONI NEWS. Much of the success of this Club has been attributed to his untiring efforts and wise leadership.

Dr. Babbitt was a character of many facets, and made distinctive contributions to all of his many and varied interests. He was an adept archer, and was particularly interested in this sport from its historical and scientific standpoint. He built and experimented with long-bows, cross-bows and the Turkish-bow, and was expert in the field.

He loved the out of doors and spent many vacations in the wide open spaces of the great west, roughing it with sleeping bag and outdoor cooking, always being accompanied by Mrs. Babbitt who likewise is an equally ardent out door enthusiast and nature fan. The last, and perhaps one of their most enjoyable trips, from which they had just returned, was their visit to the California-American Federation Convention in San Diego. Probably no one present enjoyed the exhibits more than did Dr. Babbitt.

On these trips he took many beautiful and often unique pictures, being expert with the camera. He was a distinguished member and past-president of the Chicago Cinema Club, and won many awards for his photographic achievements. At one time, being unable to purchase equipment wanted, he developed a method of synchronizing sound with pictures which he later patented, and sold the patent rights for this invention.

Dr. Babbitt's last, and perhaps his most vital current interest, was the *Earth Science Digest* to which he gave much of his precious leisure time, and had made great plans for its future. Upon its recent revival, he assumed its editorship willingly, and experienced much pleasure and satisfaction from his efforts in its behalf. His associates in this venture realize and appreciate their great indebtedness to him for the high quality of its content and editorial policy set by him, and pledge themselves to carry out and to strive to maintain its excellency and the standards he achieved in the memory of Bethel J. Babbitt, our beloved friend and associate.

SCIENTIFIC ARGUMENT SETTLED?

GULF OF MEXICO NEVER WAS PART OF LAND MASS

Twelve Columbia university scientists have reached this conclusion after spending two months aboard a floating laboratory during the summer of 1953 in an effort to settle this controversy concerning a geologic history of the Gulf of Mexico.

The argument has centered on this question: Has the Gulf of Mexico always been a body of water, or is it a sunken land mass that once was part of the North American continent?

The answer, according to the data brought back on the sailing ship, is that the gulf has been from time immemorial what it is today, a body of salt water.

Always Water Filled

"We have proved to our satisfaction that the gulf is what we refer to as 'a typical body of water', meaning that it was never part and parcel of a land mass," explained John Worzel, an associate professor of geophysics, aboard the three master schooner, the Vema. "In this respect, it is like the Atlantic Ocean, which has always been an ocean."

He said this conclusion had been drawn from the extensive studies made by the scientists of the type, depth, thickness and general contours of rock and sediment on the gulf's bottom.

"We used special electronic sounding instruments for measuring and recording certain aspects of the bottom of the gulf," he said, pointing to a cluster of apparatus in the chart room of the 202 foot ship.

Graphs Transcribe Data

The data were transcribed on grafs by instruments that give the scientists an accurate picture of the structure on the gulf's floor. Their analysis revealed that its geological make-up was similar to that of the Atlantic and did not resemble that of the continent.

This information was not obtainable on earlier explorations, because, as Prof. Worzel said, the necessary instruments were not available. The instruments used on the Vema were developed by the navy and the Lamont observatory.

Of course, it is assumed, that, in speaking of the Gulf of Mexico, the great central area of the Gulf is referred to, as implications indicated by the occurrence of oil fields of considerable magnitude along marginal coasts, would be that there may have been considerable and repeated elevations and subsidence of the nearby lands during past geologic ages.

See clays magnified 18,000 X—and read Hyatt's article telling of their great importance in November issue.

EARTH SCIENCE QUIZ NO. 8

TEST YOUR KNOWLEDGE! How much do you know? How many of the following terms can you define? They are arranged in three groups with progessive difficulty. Group 1, things everybody should know; group 2, things good "rock-hounds" should know; group 3, things which experts might be expected to know. Try your luck. To score—add up total points as indicated by the group number and rate as follows: 1-6 poor; 6-13 good; 14-20 excellent; 21 perfect. (For answers see page 34.)

a.—(1) amber
b.—(1) cinnabar
c.—(1) seam
d.—(1) metamorphic
e.—(1) tufa
f.—(1) arborescent
g.—(2) bronze
h.—(2) specific gravity
i.—(2) tiff
j.—(3) hyalite
k.—(3) molecule
l.—(3) Petosky stone

IS BOISE SITTING ON A VOLCANO?

A VOLCANIC LACCOLITH IN THE FAR WEST
GEOLOGIST TELLS OF THE LITTLE TABLE ROCK

by Edward F. Rhodenbaugh

FOREWORD

The location of Boise, the largest city and capital of the State of Idaho is no accident. Its site could be called strategic since the U. S. Military Department established it as Fort Boise in 1862, and gold hunters returning from Boise Basin, forty miles upriver, laid out the first irrigation ditches and turned to farming on the rich bottom lands nearby.

The high granite peaks and shoulders of the Boise Ridge trending in a north-south line lie but a few miles east of the city and grassy foothills cascade down to the northerly city limits. To the south and southwest three broad, flat mesas or river terraces step up in succession from the lower valley floor. The first of these is partly covered by the spreading city and the Country Club Golf Course, and the second occupied by the Municipal Airport and the extensive Gowen Field military installations. Westward the mesas widen to a checkerboard of irrigated farms.

Up the valley eight miles it narrows to a high-walled basalt canyon —'Gateway to the Mountains'— from which Boise River debouches and flows down past the largest city park and the 90 acre campus of Boise Junior College. Here and in all directions the city, as seen from the Union Pacific Station on the edge of the first mesa, presents the appearance of a vast grove thru which the Capitol Building, the Boise Hotel and business Blocks protrude. Capt. Bonneville and party once viewed this scene from the mesa rim and exclaimed, "Les Bois"! (The woods!) The cottonwood forest that those dusty explorers saw has long since been replaced by hardier trees, but the woods remain.

Towering 900 feet above the city at its eastern edge, is the great flat-topped mountain known familiarly as Table Rock. It must have arrested the attention of the earliest red men and all who have followed since Bonneville. Past its massive base flows Boise River on its way thru the fertile lower valley to join the great Snake River 50 miles to the west.

Little Table Rock nestles against the western flank of the greater Table Rock. It is with this seemingly minor topographic feature that we shall be concerned in the following article.

Little Table Rock

Thrusting upward some 200 feet from the valley floor, about one-quarter mile northwest of the Idaho State penitentiary, is a conical-shaped rock structure that some observers have regarded as a former volcano. This view probably came from the fact that it is composed of igneous (heat-formed) rocks and natural hot water has been seeping out from its base for a long, long time.

Its shape is revealed by several dikes, or wall-like ridges of rock that stand out in relief from the steep south flank of the structure. On the very top erosion has left some rounded towers and boulders and slightly back from these at a higher elevation are sandstone beds that are bowed upward to form Little Table Rock. Evidently the cone-shaped mass of igneous rock is but partially revealed since much of its bulk seems to extend back northward beneath the sandstone beds; also it probably has a wide and deep foundation which will be referred to later.

For identification purposes we shall now refer to our igneous rock structure as a

Dikes on an eroded laccolith near the Wyoming-Idaho border-line, as seen from U.S. Highway #30. ***(Photo by Edward F. Rhodenbaugh)***

laccolith, which the reader may look up in any good text on geology. The rocks that compose it vary much in color and texture; some look like basalt and all are discolored and weathered. The freshest specimens have come from a tunnel (now caved in) that was once blasted and picked into the base in the search for a gravity flow of hot water. This unweathered rock is almost a black glass with light-colored plagioclase feldspar crystals imbedded in it. It has been identified as an andesite—porphry.

Lindgren's Interpretation

In the Boise Geologic Folio (1902) Waldemar Lindgren, one of America's most noted geologists, has this to say:

"The rock is closely related to andesite and this intrusive is the only one of its kind in the Quadrangle. The intrusive mass appears as a knob a few hundred feet long (as exposed) and over 150 feet high covered by an arched stratum of sandstone (Payette Formation) very clearly uplifted by the force of the intrusion. In the cut at the hot water reservoir (now abandoned) the sandy strata near the contact locally seem to be disturbed, dipping south-easterly at a sharp angle. This intrusion appears to form a laccolith in miniature. The (unweathered) rock is dark and glassy, not holocrystalline as would be expected and consists of small porphyritic soda-lime feldspars (andesine) and small augite crystals in a brownish perlitic glass with many feldspar microlites." (Parenthetical words in the foregoing are by the writer.)

Wells Drilled

Many years ago the Boise Artesian Hot and Cold Water company drilled some wells just east of the laccolith. Two of these went to a depth of 450 feet and one to a depth of 750 feet. In all of them hot water at 178 degrees Fahrenheit rose to near the surface and pumping has continued since then. Boise has long been widely known as a city which heats many of its homes by natural hot water as well as supplying a large natatorium pool. The output at present is about one million gallons per day.

Hot springs in Idaho are fairly well distributed but are certainly most plentiful in the mountainous central portion where human population is most sparse. The total number of such springs would run into the hundreds — perhaps there are a few thousand of them. All of them seem to be associated with igneous dikes, laccoliths, or buried lava flows which is significant. Most of them are mineralized.

The reader may wonder if we have overlooked something in assuming that the Boise hot springs and wells get their heat from the buried portion of the laccolith. Could it be that a deep fissure in the earth supplies the heat? Let us examine that idea.

Temperature Rise

Records of borings from many parts of the world indicate an average rise in temperature of about 1 degree for each 60 feet of depth. Most cold springs and wells provide water at around 60 degrees. Thus to get water at 170 degrees or 110 degrees higher, he would have to go down 110 times 60 or 6600 feet — well over a mile.

The catch here is that drillings below 3000 feet seldom find any water — the rocks are too compact and fissures and fractures are absent. As an example the Butte copper mines are now below the 2500 feet level where it is quite warm, but dry. Iowa has many artesian wells that get their supply from the St. Peter sandstone; one such well at Ames is 2200 feet deep and the water is lukewarm.

Evidently the same rule about lack of water at extreme depth in borings would

THE BOISE LACCOLITH

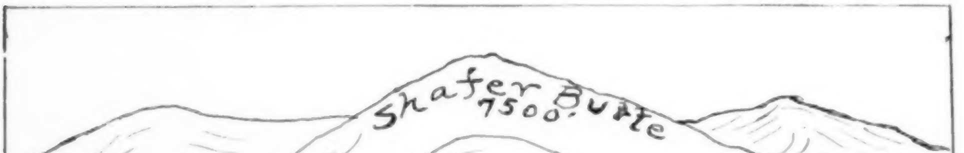
Showing "Little Table Rock" in the background. Note prominent dikeing in foreground revealed by differential erosion of the slope. (Photo by Edward F. Rhodenbaugh, Boise, Idaho)

apply to natural fissures or faults, so we go back to our first conclusion that the still-hot basement of the laccolith acts as a "booster" of heat. Prior to heating, the water was in the sandstone beds of the Payette formation that lie up against the granite of the Boise ridge. The minerals that appear later in the heated water were acquired from contact with the igneous rock — the andesite.

Source of the Heated Water

Data have been given to show that the earth's temperature at a depth of somewhat over a mile could be 178 deg. F. or even more but it is also true that ground water does not penetrate to so great a depth. This does not bar the pressure of magmatic water nor water that is in chemical combination in deep sedimentaries or other kinds of rocks. Such water would be released only if heated magmas rose in dikes and intrusive masses close to the earth's surface where there is less overlying pressure.

Some years ago exhaustive government tests were made in drill holes made in the Yellowstone Park and conclusions were that only 15% of the water erupted in geysers, hot springs and fumaroles had its origin as true magmatic water and that the bulk of such water and steam was originally ground



DIAGRAMMATIC SKETCH OF THE BOISE LACCOLITH AND ENVIRONS. ***Drawn by the Author. L. Laccolith C. Conduit beneath laccolith. S. Sill of andesite or basalt. S.S. Sandstone beds, Payette Formation. T.R. Table Rock. L.T.R. Little Table Rock. H.W. Hot Wells, Boise Water Corp. F.F. Foothills. W.S.A. Warm Springs Addition to Boise. I.S.P. Idaho State Penitentiary.***

water that had penetrated downward a few hundreds of feet where it had encountered steam rising from highly heated rhyolite sills and other masses.

The park area has abundant snowfall to replenish the zone of ground water but there is evidence that former water tables were higher than at present because abandoned and crumbling hot spring and geyser deposits lie on slopes at higher elevations than the present active areas in the valleys below.

In the Boise hot springs and wells the water is all, or nearly all, of ground water origin. One may conclude that the still heated rocks below are neither as extensive nor as hot as in the superlative Yellowstone Park area.

Additional Data Since Lindgren's Study

At the time of Lindgren's study the borings at Kellys' Hot Springs just east of Table Rock had not been made. There at a later date a cloudburst coming down the small canyon above destroyed the large pool and ruined the wells. This installation has never been restored. Rumor has it that the water was not very hot and not too plentiful.

West of Table Rock the results of borings have been more favorable. Wells only a hundred feet or more in depth within the city limits of Boise have furnished thermal waters of varying temperatures. One of these is several miles out to the southwest near the Country Club. The ones near the Milstead Floral Company northwest of the city are noteworthy. One well on O'Farrell Street in the city was reported as quite hot and is now capped.

This pattern of rather widely distributed warm and hot wells would imply that the heating source below must be of even wider extent and at no excessive depth. A buried lava sill probably connected with the Little Table Rock laccolith would meet the requirements.

At the laccolith itself certain exposures show a rock very much like basalt — more basic than andesite — and this could mean a later intrusion up thru the same conduits or channels provided by the earlier one of andesite. If the first laccolith was in late Pliocene time this later basaltic intrusion could well be of Pleistocene or even later age. The wide buried sill that has been mentioned as a source of heat for the thermal waters of the many wells could be of this younger basalt and that could be the best reason why such waters are *still* hot. All this may be verified by future study.

Some Conclusions

As stated, the form of the igneous body of rock is probably that of a thick horizontal SILL and the laccolith is a sharp bulge on its top. The whole semi-fluid mass was originally forced up into and between the lake beds of that time. Erosion has since stripped away fully a thousand feet of sandy lake beds. Table rock, itself an erosion remnant capped by harder strata, stands fully 700 or 800 feet above the laccolith. Boise river formerly swung in sharply against the base of the laccolith and was the main agency in exposing the southern flank which we see today.

It may well be asked: Where did the andesite magma (molten rock) come from? A deep fissure and dike is its probable source and this dike lies concealed beneath the buried mass. The dike, now effectively plugged, extends down to profound depths where highly heated magma probably still exists. The time of actual activity must have been *after* the lake beds were laid down as we have noted.

There remain today no evidences of a "break through" of the overlying beds though they appear to be arched upward and somewhat baked by heat over the laccolith. There being no cinders or lava flows of this kind of rock to be found in the vicinity, we therefore conclude that there was no volcanic eruption. The whole affair seems to have chilled and stopped short of

(Concluded on Page 27)

WHERE DID THE SANDS RUN OUT?

(Prize question for September)

Often we hear the expression, "the sands of time run out," and how true. Many years ago the sands, the "Black Sands" ran out on no less a personage than Thomas A. Edison, the great inventor, and thereby hangs a tale.

It is not generally known that Edison, with all his versatility, was ever greatly interested in the field of mineralogy, and yet, such is actually the case. Indeed, at one time he sank not only his entire fortune and went almost a quarter of a million dollars in debt on a venture which turned out to be a great financial fiasco, but which nevertheless proved his foresight to be almost sixty years ahead of his time.

Naturally, being the great electrical genius he was, and especially interested in magnetism, he became intrigued with the problem of magnetic separation of ores. In the early nineties of the last century, as the great Pittsburg iron industry was expanding into gigantic proportions, more and more ore was constantly needed to keep the furnaces going. Better grades of domestic ores were fast becoming scarce, and there was considerable alarm that they might soon run out entirely. Actually a situation developed comparable to the crisis which has brought on the close scrutiny of our taconite resources today.

It had long been known that throughout the entire length of the Appalachian range there existed almost endless quantities of low grade deposits, containing sufficient iron, could it be economically concentrated, to supply all our needs, perhaps for centuries.

It was in the development of such a project, resorting to magnetic separation of the iron from the gangue, located in New Jersey, that Edison figuratively "lost his shirt,"—not on account of any lack of success in the process from the engineering or scientific standpoint, but due solely to the fact that the Edison Corporation came into the market with their concentrate, at almost the identical time that the great ore development of the Mesabi Iron Range of Minnesota took place.

Previous to undertaking this huge project in New Jersey, Edison did some earlier experimentation with magnetic separation of iron sands along the Atlantic sea-shore. At one point in particular there were immense deposits of "black magnetic sands" on the beach which would have proven very valuable could the iron have been successfully separated from it.

Exploration showed that there were many miles of black sand deposits, ranging up to six inches in thickness, literally hundreds of thousands of tons, which would have been very easy to separate. A small pilot plant was erected nearby, but just as the project got under way a tremendous storm came up, and every vestage of the black sands went out to sea, *never to return again.*

Alert: One annual subscription to E.S.D. will be given the first person (earliest post mark) reading this story, who writes us such details concerning the feature, as the exact location of these "black sand" deposits, and the time and circumstance concerning the pilot plant project. This information will be published and the subscription credited to advance, or, to any other person designated by the winner.

Mail to the Editor.

* * *

Strontia Crystal Cave? Prize question for July.

The first four letters answering the July question were received as follows, all were correct and in complete agreement: John E. Hufford, Omaha, Nebraska, July 18th, 1953; Reverend William J. Frazer, Moosic, Pennsylvania, July 20th; Anthony J. Kindt, Put-in Bay, Ohio, July 23rd; and Robert Ante, Covington, Kentucky, July 26. Nice work gentlemen, and to the first two we are extending a year's subscription to *Earth*

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The Iron Ores Of Southern Minnesota

by Geo. A. Thiel, University of Minnesota

Not all of the iron ore shipped from Minnesota comes from the Mesabi, Vermilion and Cuyuna ranges. The early settlers in southeastern Minnesota found layers of iron oxide in their dug wells or they plowed up loose chunks while cultivating the land. Such occurrences have been reported for nearly every county in the area of Paleozoic sedimentary rocks southeast of the Twin Cities. Similar thin beds of ore occur in Iowa where they have been mined at Waukon, and they extend also into Wisconsin where they have been utilized on a small scale. The geographic distribution of the ore is almost coextensive with the Paleozoic rocks and it rests on rocks ranging in age from Cambrian to Devonian with some associated with Cretaceous sands and shales.

At Mankato and Kasota the iron oxides cover the old weathered surface of the Oneota formation and descend into the ancient caves and sinks that were developed during the post-Ordovician-pre-Cretaceous erosion interval to form crusts on their walls. Here and there the iron-bearing solutions penetrated the siltstone floor of the caves and channels and infiltrated the upper part of the Jordan sandstone. In the region southeast of Spring Valley where it is being mined, the ore lies on the Cedar Valley limestone of Upper Devonian age. Here

An iron ore pit showing the nature of the topography in the region of the iron deposits.

also some of the sinkholes and channels in the limestone are filled with ore.

Generalized Section at an Ore Body

	Thickness
Drift—Sand, gravel and boulders	3- 10 feet
Cretaceous — Interbedded clay and sand, buff to light gray	5- 15 feet
Devonian to Cretaceous — Iron ore, both earthy and hard, vesicular limonite	2- 20 feet
Devonian — Dolomitic limestone	75-150 feet

rence of thoroughly cemented "iron conglomerate," all suggest that the accumulation of iron ore continued during at least a part of the Cretaceous.

The bottom of the ore rests on an uneven surface of limestone. Numerous masses of the limestone extend up nearly to the top of the orebodies and residual limestone boulders in the ore show all stages of leaching from limestone to residual calcareous, quartz and iron carbonate silt. Locally there are depressions filled with clayey siliceous silt which is partially infiltrated with iron oxide.

Photo of the wall of an iron ore pit. The sand and silt over the ore is about seven feet thick.

Some of the ore is contemporaneous with the Cretaceous sediments, but at most localities there is a distinct break between the ore and the yellow gravels and sand of the Cretaceous. The permeation of the gravel by yellow iron stain, the cementing of the sands by iron oxides, the extensive occur-

Much of the ore is soft, earthy and porous with many of the pores partially filled with clay and silt. Irregular concretionary masses with concentric deposition around clayey centers are very typical. The hard ore occurs in solid masses or in honeycombed, ramifying chunks, and nodules. The harder portions are brown in color, usually showing a dull luster on smooth, freshly broken surfaces. Many of the cavities are partially filled with a yellow ocherous powder, or with fine carbonate silt.

Mineralogically the ores are impure mixtures of hydrated oxides of iron containing varying amounts of limonite and goethite. The impurities are mainly silica and phosphorus. The silica content varies from 5 to 35 percent, and phosphorus is rarely less than 0.1 percent and may be as high as 2 percent. The average of ten analyses yielded 49.65% iron, 14.30% silica, 0.99% aluminum oxide, 0.22% phosphorus and 12.5% loss on ignition. More than 2,000,000 tons of such ore has been shipped from the region southeast of Spring Valley.

The origin of the ore is very different than that of the Mesabi and Vermilion ranges where the ore was concentrated from an iron formation containing from 20 to 30 percent of iron. The ores in southeastern Minnesota were derived from dolomitic limestone which contained an average of no more than 1% of iron. In view of the fact that much of the ore in the Spring Valley region shows evidence of deposition from solution, it is not a true residual de-

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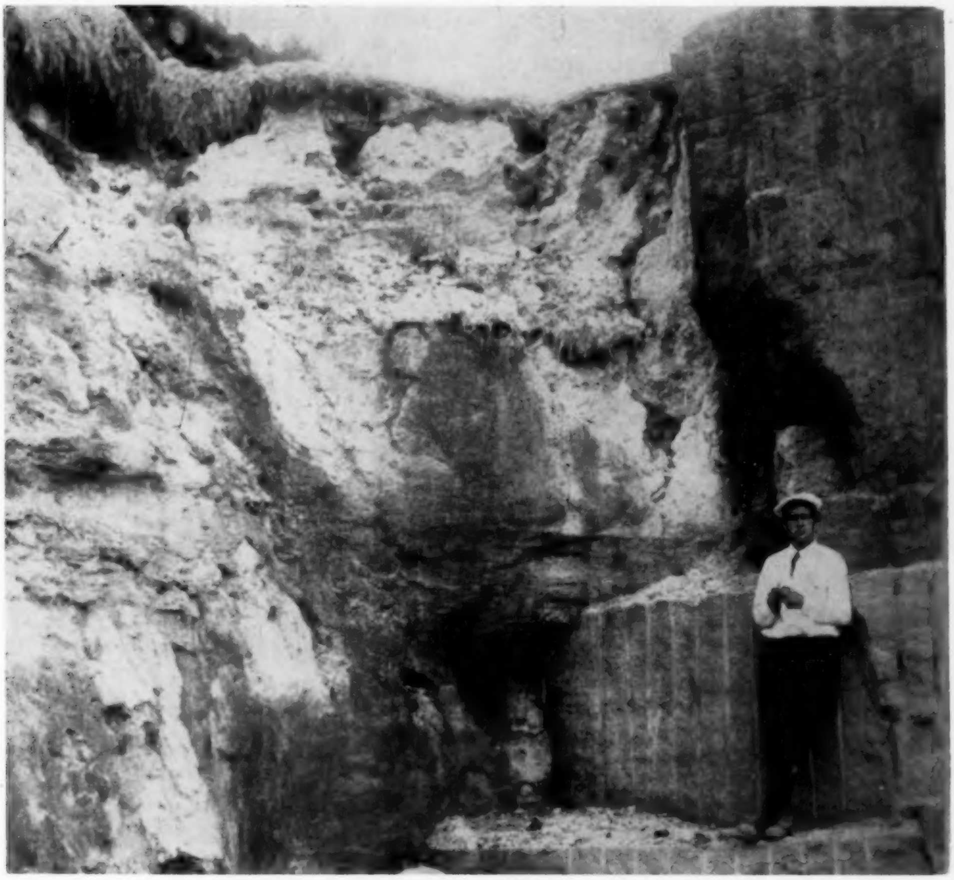


A quarry showing the outline of a solution cavity filled with clay and sand in the Oneota dolomite. Iron ore fills similar sinks in the Cedar Valley limestone near Spring Valley.

A ROOTLESS MOUNTAIN !

Actually it is a lusus naturae—this soaring Ages-old rock heap. For the manner of its birth, lately discovered, is in direct reverse to that of other Pacific Coast mountains, or maybe elsewhere on this North American continent for that matter. Earth scientists list many marvels of geologic interest, but this mountain upsets all geologic laws having a head far older than its torso and feet.

There are many freaks of geological interest like Oregon's Crater Lake, that was formed when Mount Mazama blew its ancient top leaving a chasm now cradling the deepest lake on this continent. But Old Mazama's basaltic roots reach to unknown depths beneath it. The Grand Canyon of the Colorado is wonder only approached by Idaho's Devils Canyon, but the roots of both are bared for geologic study.

But this mountain to be described has no roots at all, so it should be of great interest to all students of earth science.

This geological oddity is Frazier Mountain in southern California, at the northwestern end of the Tehachapi Range and about 70 miles northeast from Los Angeles. Its summit soars almost straight up for 4,000 feet above Gorman Village; and between the mountain and the town U.S. 99 runs its four-lane highway atop the San Andreas Rift.

Only 30 miles to the northeast stands Bear Mountain, which is the epi-center of the latest major quake, on a branch of this San Andreas Fault extending almost the whole length of the State.

At Gorman the elevation above sea level is 4,000 feet, but Frazier Peak has an altitude of 8,026 feet—4,026 feet above Gorman. From its high peak, Frazier Mountain as a whole extends westerly and is crowned by an unusual plateau that is 8 miles long by 4 miles in width, with a thickness of from 1,200 to 1,900 feet. It is all well timbered, has game in abundance, and a Lookout Station on its Peak.

It looks normal, until it is known that its flattish granite crown extends downward for only an average depth of 1,500 feet. This was determined less than 20 years ago, by Geologist J. P. Buwalda and Geophysicist Beno Gutenberg, of Carnegie Institution, Seismological Department, Washington, D.C. And part of their report reads as follows:

"Frazier's upper granitic crown is an overthrust extruded from the nearby San Andreas Rift. It was first shoved up as an immense wedge-like mass, then as a gigantic slab by a successive series of quakes, but slowly and only 20-30 feet at a time. These movements probably were centuries apart, but finally was pushed over on top of the underlying sediments in a mass estimated at about 123 billions of tons. Centuries later, of course, it eroded to its present contours.

"It very likely is a small remnant of the original extrusive mass, but from what depth it came is hard to say—possibly several miles as a matter of pure guesswork."

Yet locally this depth is small, for at Artesia some 70 miles southwest of Frazier Peak, these scientists found an overburden of sedimentaries on granite bedrock of 22½ miles, thickest in the world.

COVER PHOTO

Three sections of a great silicified log in the Chinle formation (Triassic period) in the Petrified Forest of eastern Arizona. Some of the logs are four feet in diameter and more than 100 feet long. The trees are not found standing as they grew, but lie scattered about in the formation, as though floated by running water until they were stranded. Most abundant is *Araucarioxylon*, resembling the modern pine-like *Araucaria*, the "monkey-puzzle" tree, native of Chile and Australia and imported into the United States.

Courtesy: H. P. Zuidema, staff member.

Worms, Earth Science and Evolution

by Burke Smith, of ESCONI

Why should scientists, especially earth-scientists, be concerned with such lowly creatures as worms, which are soft bodied, insignificant in size, and have a very fragmentary fossil history? One good answer to this question is that Charles Darwin was interested in worms, and anything in which he took a serious interest usually turned out to be scientifically significant. In 1881 he published a monograph, *The Formation of Vegetable Mould Through the Action of Worms,* which shows with his characteristic thoroughness the incalculable value of earthworms in turning over the soil, enriching it with vegetable matter and aerating it. He figured out that ten tons of soil per acre passed through its earthworm population every year, resulting in a covering of new soil over the entire surface of the acre three inches deep in fifteen years. That would be almost eighteen feet in a thousand years, enough to submerge a one-story building in soil and preserve it for future archaeologists!

Following in the steps of Darwin, scientists today interested in the riddle of evolution do not consider it beneath their dignity to spend a lifetime studying the various kinds of worms which inhabit the earth. For in addition to the practical value of worms to soil culture, their life histories and detailed structure are a gold mine of information for piecing together the threads of animal history from Ameba to man.

The first principle in thinking about worms is to realize that not all worms belong to the same animal group or phylum. The worm shape has come into being in a number of different animal groups at a number of different times in response to what may be called a burrowing mode of life. Consequently a wormy exterior may conceal a whole world of differences in internal structure which is laid bare only with the dissecting knife. From a study of their insides, worms have been separated into at least half a dozen distinct phyla. There are (omitting the long and ponderous scientific names of the groups) flatworms, nemertine worms, round worms, annelid worms, acorn worms and a number of other small groups which the specialists are often undecided among themselves just where to place on the family tree of animals. Of all these groups, only the annelid worms have unquestionably been found in fossil form. Some of the others have left fossil trails or burrows we are sure, but usually we cannot tell which trail or burrow belongs to which worm group.

Even without fossil remains we can still get a pretty good idea of which group came first in the course of evolution and can arrange the groups in sequence by comparing the structure and development of their members. Free living flatworms are small creatures less than an inch long which glide over the under surface of rocks in lakes or streams. They are the most primitive worms, and as their name implies are flattened into a ribbon shape. Noteworthy as the first animals to show two-sidedness, they also developed a body layer of cells similar to our muscle layer. Without the invention of this middle muscular layer of cells, the development of large and complex animals such as the vertebrates would be impossible. Unsavory relatives of the flatworms at the present day are tapeworms and parasitic liver worms.

Next above the flatworms is an obscure phylum of marine worms, the nemertines, remarkable as the first animals who perfected a closed system of blood vessels, and circulation of the blood. This is rather unexpected of such primitive creatures. The nemertine worms also make use for the first time of a two-way digestive system, with mouth and anal opening at opposite ends of the body. In animals lower on the scale of life, such as the flatworms and jellyfish, what remains of food taken in has to be voided through the same common opening. A special feature of nemertines is their long proboscis which can be shot out from the mouth cavity to catch food on the run. These worms are sometimes called the proboscidian worms for this reason.

Next come roundworms, which as their name indicates, are round, unsegmented white worms, rather pointed at both ends. They range in size from about a foot long (Ascaris, a parasite in the human intestine is one of the biggest) to microscopic size, as represented by the parasitic hookworm which has caused so much misery in the southern United States. Round worms are of considerable medical importance because of their many parasitic species but from the point of view of evolution they are perhaps not as noteworthy as some others. Small roundworms are extremely abundant in soil and can usually be seen threshing about in a characteristic manner in fresh samples of earth when examined with a low-power microscope. Some day, fossil roundworms may be discovered as parasites in the intestine of Pleistocene mammals frozen in the Artic ice, but at present there are no fossils on record.

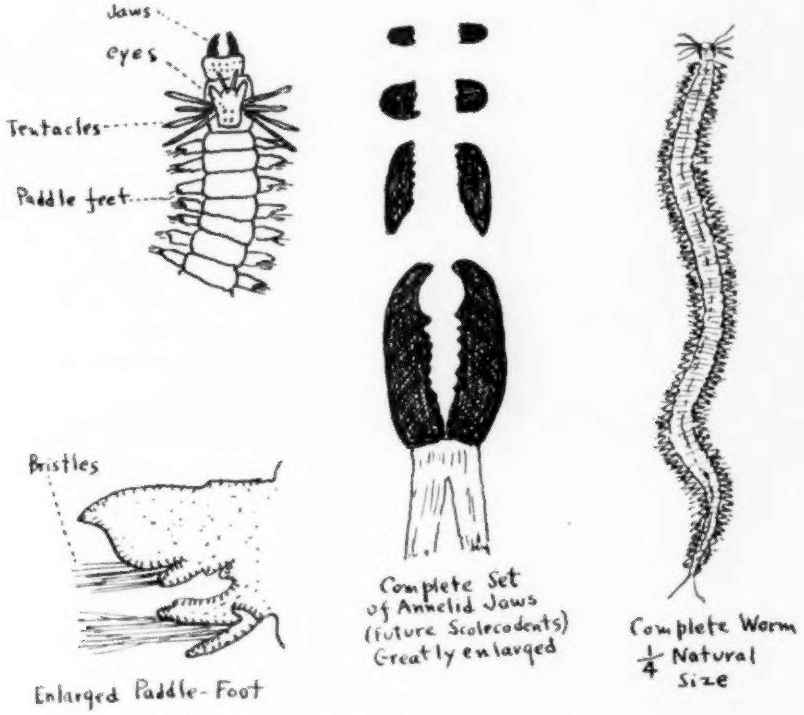
We could go on at length describing various other obscure groups in the worm category, but it is the annelid worms which claim attention as the highest group of worm-like animals and the only worms with indisputable and complete fossil remains. Annelid worms are of considerable evolutionary significance as forerunners of the arthropods, the most biologically successful animals on earth today with the very recent exception of civilized man. ("Arthropod" refers to the jointed legs of these animals, and includes the fossil trilobites as well as living crabs, spiders, insects and others of their kind.)

In order to arrive at an arthropod, which is also a segmented animal, nature started with the annelid worm, incorporating the advances of the lower worm groups into a body arranged in segments. The name "annelid" from the Latin "annuli" means "ring," referring to the ringed sections which together make up the animal. Everyone reading this article has seen an annelid worm, for it is the common earthworm whose habits Mr. Darwin so diligently studied. The earthworm is, surprisingly enough, a rather specialized animal which has lost some important structures possessed by its ancestors, notably a head complete with eyes, jaws and feelers, and a series of legs, one pair to each body segment. Of the head, no vestige remains except the mouth, but the leg remnants are still observable as tiny bristles. If you are not too squeamish to let an earthworm crawl through your fingers, you can feel these bristles quite distinctly. They give the worm traction as it moves through its burrow, and helps it resist the pull of that worm-killer, the robin.

The ancestor of earthworms undoubtedly came from the sea, and earthworms show their aquatic origin by their need for a moist underground life. They have never gotten used to living in sun and air for any length of time. A few of their close relatives, the leeches, fare better on dry land, but most leeches are aquatic semi-parasitic blood suckers. Neither earthworms nor leeches are on the main road of evolutionary advance to the arthropods. It is the marine annelid worms which are closest to the creatures which gave rise to the dominant group.

In the shallow waters near the sea shore, we find living annelids which probably have not changed a great deal since their ancestors evolved over a billion years ago in Proterozoic times. At present these worms burrow in sand or mud, leaving only the head exposed. By moving the body up and down they create a current through their burrow which brings to them small animals, which they catch with well-developed jaws. Picture a green worm about a foot long, with frilly edges sticking out the sides of each segment, topped by a tentacled head, and you have the essence of an annelid marine worm. The worm can leave its burrow and move freely through the water by means of many paired paddle-legs, one set to each body segment. These that sheathes the more successful arthropods, a horny substance called "chitin," but the chitin is much thinner than on lobsters, crabs or even insects. The organs inside the body are duplicated over and over again, packaged separately within each segment, except for the continuous digestive tube, blood vessels and a pair of nerves running down the under side of the animal. Arthropods have a similarly placed set of nerve cords.

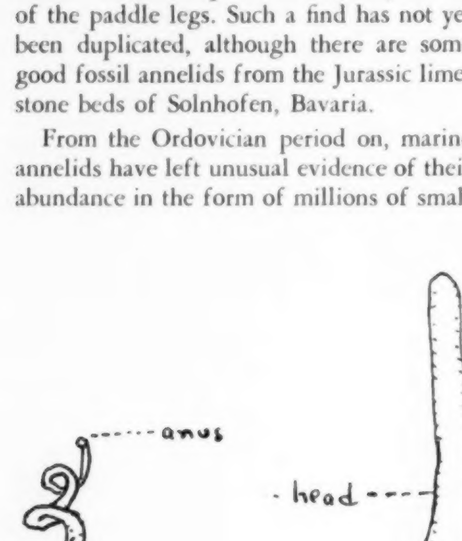
Most of the fossil worm burrows and trails preserved in Precambrian and later



DETAILS OF ANNELID WORM

paddles are split below into a number of smaller projections, and have tufts of protruding bristles to strengthen them. At the head, the paddles are modified to form mouth parts, including horny jaws of several sizes. The animal can see by means of two pairs of eye-like structures, and has a number of antennae sensitive to touch. Its skin is covered with the same material rocks were undoubtedly made by such marine annelids. There was a time when annelids were the highest type of life on the globe, but that time is lost in the dim mists of the early Proterozoic, from which no fossils survive. The earliest fossil annelid remains date from Midcambrian black Burgess shale in British Columbia. Here at the base of Mount Wapta have been found some marvelously etched impressions of whole worms complete to each tiny bristle of the paddle legs. Such a find has not yet been duplicated, although there are some good fossil annelids from the Jurassic limestone beds of Solnhofen, Bavaria.

From the Ordovician period on, marine annelids have left unusual evidence of their abundance in the form of millions of small



Diagrammatic Sketch of Acorn Worm

shiny "scolecodents." Upon close examination, these objects turn out to be the jaws of the animal. Modern annelids have a mouth containing four sets of these jaws, which are tough and hard. Naturally these parts resisted decay and fossilized long after the softer worm body had vanished. In a few cases, the complete set of jaws have been found in the position they occupy in the live worm, and with a little imagination we can almost reconstruct the vanished worm-head around them.

Some annelid worms today are able to burrow into shelled animals, possibly by means of the rasping action of their bristled feet, and similar holes in fossil shells have been thought to have been caused by prehistoric worms. Sea lilies from Jurassic times were sometimes infested with small oval parasitic annelids not unlike similar parasites found clinging to the outside of crinoids alive today. A number of other supposed cases of worm fossils are just doubtful enough to discourage an ambitious paleontologist from staking his reputation on their positive identification. They include possible earthworms, worm tubes and worm castings. In spite of the present meager fossil record, there are no doubt a considerable number of finds waiting to be made, as under special conditions we have seen that worms can be preserved in minute detail.

To make an annelid worm into a primitive arthropod similar to a trilobite, for example, is a comparatively easy evolutionary task. The raw materials are already there in the annelid worm, with only a change in proportions needed. Foreshorten an annelid, flatten it into an oval, cut out many of its segments, and the trilobite is almost a reality. The annelid chitin needs only some thickening to make a trilobite carapace. The eyes, jaws and antennae are also there for modification at the hands of nature. About the only new inventions which a trilobite has are the jointed legs, which were perfected from the crude annelid paddles during the vast time span in which evolution works its unhurried miracles.

We may not like to admit it, but a different line of vermiform evidence shows that backboned animals from fish to man also started from a worm-like ancestor. There are living in the sea today worms

(Continued on Page 30)

Blasting Is Not For Amateur Rockhounds

by Jay E. Farr

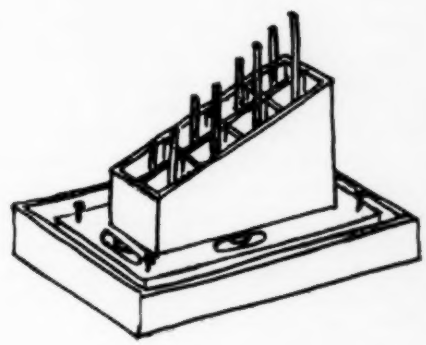
This little thesis has nothing to do with personal safety. What would be the use of talking about that to a buch of ?? who will climb high up on the side of a terribly dangerous place or squeeze down into some other place or pry around on something or bang away on any old thing without wearing their gloves or goggles? This article, in an indirect way deals with economics. It does not take into account the value of your hands which may disappear if you don't handle the dynamite cap just right or the rest of you which might conceivably be sprayed to the four winds. It has to do with the subject of getting sued.

The older and crackier an old abandoned building is the more important it seems to the owner to have it repaired or replaced and a blast within hearing distance seems to be a wonderful excuse for a claim. If a certain condition exists and if you have blasted you may have occasion to try to disprove the allegation, no matter which came before the other, and without any "before and after" photographs it may not be so easy. Those to whom blasting is a must have learned that some real scientific evidence is handy stuff to have around at a time like this.

The know about how much dynamite they can shoot in certain kinds of soil within certain distances of buildings without cracking the plaster and they know that they should keep an accurate record of the amount of each charge and the time when it was fired and some of them have discovered that it is also handy to have a record of the actual amount of disturbance caused by each blast. Actual records of the exact nature of each disturbance could be made by making use of a recording instrument such as the seismograph or the accelograph but the services of a trained geologist would be required to interpret the results.

A simpler and more practical device for this purpose is a device known as the "falling pin seismometer." It is set up in the nearest building or at some reasonable distance from the work and its reaction is observed by accepted witnesses at the time of each blast.

The falling pin seismometer is based on the principle that if you stand a pin on end it will fall over if you jiggle



Falling Pin Seismometer

the table. Of course it has a few refinements to make it scientific and in part *they* are based on some kind of mysterious mathematics but when you see one you will note that it isn't very complicated. The first thing you will notice is that it has more than one pin and that the pins are of different lengths, the longest being possibly 15 inches and the shortest possibly 4 inches. They are round and real slim for their height (only .250 inches in diameter) and made out of shiny metal so they will command the respect due a scientific instrument of such importance.

On the base of the instrument there is a secondary base made of plate glass and fitted with accurate levels in two crosswise directions and fine threaded leveling screws for leveling the glass exactly. It is on this glass that the pins are stood on end when the instrument is set up for use. The pins are stood up in little square compartments about the size of those in an egg case and about as deep as the heights of the various pins. The purpose of these compartments is two fold. They keep one falling pin from knocking the others over and they provide a place to steady your hand while you are "trying" to stand the pins on end. To a degree they also help to keep flies from alighting on the pins and upsetting your results.

You cna almost guess the rest of this story. A slight jiggle will cause the tallest pin to fall and a little harder one will topple the next and so on. The instrument is so calibrated that the amount of vibration can be determined by observing which pins fall when the blast occurs.

If no pins fall you might know for example that the vibration was less than .015 which is know to be of such small intensity that it will not damage plaster or masonry in any way. If they all fall over you had better accidentally stub your toe on the thing, clap on the lid real quick or pick up the pins or something. Whatever you do don't just stand there.

One interesting thing to know is that most people can readily feel a vibration of .005 inches and will actually be startled by a vibration of less than .010 inches either of which intensity would not damage a building.

Another interesting fact is that contrary to most people's opinion less vibration is transmitted by a certain blast through solid rock than would be transmitted by the same blast through a deep deposit of soil.

Through soil more than 50 feet deep you can not safely predict what might happen within a radius of 75 feet (you might even get whammied on the ear by a thunder egg) but according to a table I once saw certain size charges of dynamite might be expected to produce a vibration of not over .015 inches at about certain distances, as follows:

Pounds of Explosive	*Distance*
20 Pounds	100 Feet
30 Pounds	400 Feet
40 Pounds	500 Feet
60 Pounds	600 Feet
80 Pounds	700 Feet
100 Pounds	800 Feet
200 Pounds	1200 Feet
900 Pounds	2000 Feet
4000 Pounds	3000 Feet
8000 Pounds	4000 Feet

URANIUM IS WHERE YOU FIND IT

by Paul C. Holman

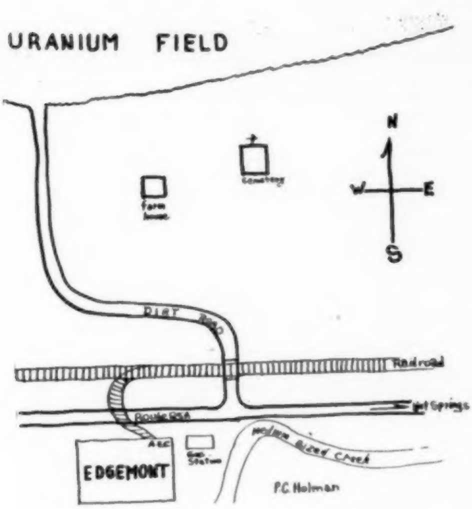
Edgemont is a dusty little town located in the southwestern corner of South Dakota, that is slowly gaining prominence as an uranium center. It has the atmosphere of a typical western cow town, boasting the usual saloons, muddy streets, and occasional Indian. There is, however, a new addition Near the railroad yards Uncle Sam has erected an efficient looking structure that is staffed by A.E.C. personnel. This is the Edgemont Uranium Purchasing Depot.

Judging from the number of signs in the depot area that say everything from Keep Out to Stay Away one would get the impression that the A.E.C. people were an unfriendly lot. However, this is not the case. I found the A.E.C. personnel to be most affable, and willing to impart any information about the uranium field that wasn't listed as confidential.

The depot manager took me on a tour of the depot whereupon we eventually reached the piles of ore awaiting shipment to the Colorado refineries. By some coincidence I just happened to have my Geiger counter with me, and of course I had to turn it on. Result: I still can't hear out of my right ear.

The ore is of the yellowish carnotite variety and occurs as a precipitate in sandstone. It's much the same type and formation that occurs in certain areas of the Colorado Plateau.

I ran a chemical test to determine if vanadium was present as the precipitating factor. I got a negative reaction. This was to be expected since a study of the topographic features of the uranium field and the surrounding area pretty much convinced me that the uranium had been deposited by slow moving streams that had probably fanned out in this area. The sandstone with



Sketch Map of Edgemont and Environs

its inherent porous characteristics would be a natural catch basin for the heavy uranium particles. There is also another alternative. The downward flowing streams could have been partially blocked by a series of hills that lie between Edgemont and the uranium field. In this instance the hills would have formed a natural dam that would have slowed down the water enough to let the uranium particles precipitate to the bottom and thence into the sandstone.

The actual uranium mining is of especial interest. A bulldozer takes a few bites out of each claim (this is public land open to entry) whence the miners sort out the uranium bearing rock into piles. When the miner has enough ore he goes to Edgemont, some ten miles south, and hires one of the local trucks to haul his ore to the A.E.C. depot where he sells it for $3.50 per pound for the contained uranium. The hauling can become somewhat of a headache since some of the hills are pretty steep and the roads aren't too good. It's definitely jeep country. A word of warning: Don't get caught in this part of the country without a few provisions. One good rain will turn the few roads into a sea of mud and muck that will bog down anything short of a seaplane.

This uranium location will hold the interest of the amateur and professional geologist. It's a large country that has been barely scratched. It's an invitation to the fellow that wants to spend a few days or weeks with a pack and Geiger counter.

* * *

Isle Royale, Michigan, the largest island in Lake Superior, and located nearer to Canada than the United States, is—with some 200 small islands surrounding it—a national park. The rocks of Isle Royale are very old, having been formed perhaps 900,000,000 years ago.

* * *

Physicists of the Bureau of Mines, Department of the Interior, are able to predict the failure of mine rock by recording with delicate electronic devices the frequency and magnitude of noises too faint to be detected by the human ear.

* * *

The highest piled inland sand dunes in the United States are the white sands of New Mexico, a spectacular portion of which is included in the White Sands National Monument. The "sands," of glistening white gypsum, constantly drift, forming dunes 10 to 60 feet high. Many small animals in the area have become light in color, an adaptation to their environment.

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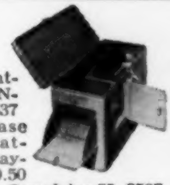

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Para Laboratory Sup. Co.
221 N. Hermitage Ave., Trenton

Westfield Lapidary & Sup. Co.
309 Hyslip Ave., Westfield

NEW MEXICO
New Mexico Minerals
11003 Central N.E., Albuquerque

Adobe Crafters
Rt. 2, Box 341, Santa Fe

NEW YORK
New York Laboratory Sup. Co. Inc.
78 Varick St., New York City

New York Scientific Sup. Co.
28 W. 30th St., New York City

The Radiac Co. Inc.
489 5th Ave., New York City

Standard Scientific Sup. Corp.
34 W. 4th St., New York City

OHIO
Akron Lapidary Co.
1095 Chalker St., Akron

Cincinnati Museum of Nat. His.
Central Pkwy at Walnut, Cincinnati

OREGON
The Rock Market
R. 1, Box 225, Eagle Point

The House of Guns
111 Washington St., Garibaldi

Hodge Podge Agate & Supply Shop
322 Hiway 99 S., Grants Pass

Wrightway Gemcrafters
P.O. Box 4, Hauser

Smith's Fluorescents
Rm. 311-220 S.W. Alder, Portland

Dorothy's Gift Shop
4639 N. Stephens, Roseburg

White's Furniture
1218 M St., Sweet Home

PENNSYLVANIA
Lost Cave Mineral Shop
Lost Cave, Hellertown

TENNESSEE
Technical Products Company
19 N. Dunlap, Memphis

TEXAS
D & B Engineering Co. Inc.
1510 S. 14th St., Abilene

Dwight's
516 Tyler St., Amarillo

Odom's
Star Rt A, Box 32-C, Austin

Nixon Blue Print Co.
Wilson Tower, Corpus Christi

Greene Brothers, Inc.
1812 Griffin, Dallas

Don A. Carpenter Co.
P.O. Box 1741, El Paso

Bell Reproduction Company
907 Throckmorton, Fort Worth

Industrial Scientific, Inc.
1014 Taylor St., Fort Worth

Ridgway's
615 Caroline St., Houston

Panther City Office Sup. Co.
315 N. Colorado, Midland

Farquhar's Rocks & Minerals
134 Hollenbeck, San Antonio

East Texas Photocopy Co.
308 N. Broadway St., Tyler

UTAH
Dr. H. T. Plumb
2400 Sunnyside Ave., Salt Lake City

WASHINGTON
Fulmer's Agate Shop
5212 Rainier Ave., Seattle

Prospector's Equipment Co.
2022 Third Ave., Seattle

C. M. Fassett Co.,
W. 7 Trent Ave., Spokane

Tacoma Lapidary Sup. Co.
631 St. Helens Ave., Tacoma

Irwin's Gem Shop
381 Chase Ave., Walla Walla

Williams Lapidary Supply
P.O. Box 50, Waterville

WISCONSIN
C-C Distributing Company
3104 W. Vliet St., Milwaukee

The House of Hobbies
721 W. Wisconsin, Milwaukee

The Stones Throw Rock Shop
221 S. Main St., Walworth

CANADA
Riley's Reproductions Ltd.
630 8th Ave. W., Calgary, Alta.

Milburns Gem Shop
1605 Trans-Canada Hwy., New Westminster, B.C.

Cave & Company Ltd.
567 Hornby St., Vancouver, B.C.

Sharpe Instruments Ltd.
6038 Yonge St., Newtonbrook, Toronto, Ont.

ULTRA-VIOLET PRODUCTS, Inc.
145 Pasadena Avenue, South Pasadena, Calif.

MINNESOTA IRON ORE

(Continued from Page 15)

posit as are those on the ranges of northern Minnesota. The amount of residual iron that could possibly have been furnished by the weathering of the beds of the Cedar Valley limestone would not approach in magnitude the ore deposits known to occur on and in that formation.

The structure and texture of the ore give no evidence of precipitation in bogs or around springs. On the other hand, the fragmental nature of some of the ore that is crudely stratified, together with the presence of rounded flint and chert pebbles in the ore, suggests some transportation and concentration by running water at the surface. Underground waters undoubtedly played a major role also. This is indicated by the conspicuous concentric banding which is characteristic of the residual limestone boulders in the ore and in the limestone strata under the ore. Still other evidence that points to the activity of ground water, is the presence of pockets of iron carbonate (siderite) in the ore. This carbonate undoubtedly represents iron that was leached out of the limestone near the surface during weathering and percolated laterally and downward where it would encounter fresher limestone which would tend to precipitate the iron carbonate, whereas the calcium carbonate of the limestone tended to go into solution. Such a process led eventually to the replacement of limestone by iron carbonate. When at a later date, erosion lowered the surface of the earth and the ground water level was lowered also, the iron carbonate zone was then in a position above the water table where it was actively oxidized and the carbonate altered to brown iron oxides.

BOISE LACCOLITH

(Continued from Page 11)

becoming a volcano which answers our first question: "Is Boise sitting on a volcano?"

There is no indication, therefore, at present, that Boise and its environs will ever be overwhelmed by a volcanic eruption, or even the extrusion of fresh lavas. The Yellowstone area still seems fearsome to many visitors yet vulcanism there has been too long ago — Pliocene or Pleistocene time — so that volcanic cones, once present, have been eroded away to their very foundations. In the New Zealand field, the second most active geyser region in the world, some volcanic vents still remain but geyser activity has been greatly reduced in historic time. The mighty Waimangu Geyser, once greatest in the world, was active until 1917 when it suddenly ceased after a volcanic explosion in a flat valley nearby. Thus, it would seem, that no one in Boise need lose any sleep over the possibility of awakening some day to find their City and environs prostrated on the slopes of an erupting Idaho Vesuvius.

CRYSTAL CAVE

(Continued from Page 12)

Science Digest, with our compliments.

We were informed that this cave was located on South Bass Island (Strontian Island) near Put-in-Bay, Ohio, in Lake Erie. It is open to the public, and except for the floor, it remains substantially the same as when first opened, all of its beauty and splendor remaining intact. "Crystal Cave" so called, is now owned by Norman V. Heineman, son of the founder Gustov Heineman. It may be reached by ferry service from Sandusky, Port Clinton or Catawba Peninsula, and by plane service from Port Clinton.

Rev. Allen P. Poe, Rector of the St. Paul's Church (Episcopal), Put-in-Bay, in Lake Erie, Ohio, recently advised that, "on Green Island, about a half-mile from Put-in-Bay, and reached by chartered boat, there is an abandoned mine of Celestite, or Strontium Sulphate, from which any number of specimen might be taken"—Rockhounds please note.

LOST MINES

(Continued from Page 3)

est man in Arizona — or the nation!

(Incidentally, he was about right. After his death, a man ground his ore sample in a mortar and got a small bottleful of gold.)

But at the time of this discovery, Yaqui Valentino moved on to work for another cattle man, who had a rancho on Rye Creek, twelve or fifteen miles south of Payson, where Rye Creek hits the upper Tonto River. There were miners as well as ranchers up there, and Valentino made the mistake of talking freely about his wonderful discovery; for everyone tried to find out where he found his rich ore, especially the miners. However, on this point the Yaqui wisely kept silent.

But from a young Mexican cowboy, he found out that some of the miners were plotting to force him to lead them to his rich find at the gun-point. Thus warned, Valentino left one night riding south again to talk things over with his one best friend, a rancher ranging beef stock in behind old Superstition Mt. near Apache Junction.

When his rancher friend saw his rich ore sample, he got very excited, and proposed they develop the mine together on shares. Of course, Valentino must show him the location first, to be able to figure out mining equipment and costs. But the Indian held back, said he would make a map instead. But the rancher feared he would get lost by trying to follow such a map in that wild country. Anyway, if Yaqui would guide him within a few miles and map the rest, it would save a lot of time and make it easy to locate the old mine shaft.

Still Valentino hesitated while considering this compromise, for the tribal law and penalty for breaking it had been deeply embedded in his memory since childhood. Then his friend, who watched him closely, added that he wasn't needed for the last few miles, nor when the mine was being developed. Valentino could go somewhere to get the rest required to combat the tuberculosis he had contracted. So, as he trusted his friend, Yaqui agreed and shook hands on it.

Yet on the long ride that followed, Valentino's inner fear of what he really was doing grew stronger. The closer they came to the Four Peaks area, the more he doubted that his specious reasoning would accom-

(Concluded on Page 30)

plish his purpose and he still could go unscathed. And he grew more uneasy and silent, until as they neared the foothill country a dozen miles from that soaring four-pronged summit, he suddenly halted his pony panic-stricken and shaking violently. Unmoved, deaf to argument, he flatly refused to go farther. Muleishly reining his pony around, he set out on the back trail—followed by his friend.

And thus it was that this rich gold vein was lost again, for later after a long illness Valentino's lips were sealed forever.

Yet geologically this area is definitely promising for all types of quartz-gold deposits. In fact, there is evidence that seems to prove that this is the real site of the famous lost mines of the Spanish miner Pedro Peralta. For six years ago, this writer published proof that it is impossible to have been in the Superstition Mt. area. And in this result of our survey, Dr. G. M. Butler of the Arizona Bureau of Mines fully agreed. So truly we can say: "thar's gold in them hills."

Ed. Note: This article is a continuation of Victor Shaw's series "Famous Lost Mines." Attention is directed to page 42 for back issues of E.S.D.

WORMS

(Continued from Page 20)

which belong to our own Chordate phylum. The acorn worm is one of them, spending its lifetime burrowing through the sand of tidewater areas. It's head or burrowing snout somewhat resembles an elongated acorn. Cut into this snout, and you will find a tell-tale rod of rubbery tissue along its back. This rod is none other than a "notocord" which is the common stiffening

rod found in all backboned animals at some stage in their development. Furthermore, the nervous system of the acorn worm runs under the notocord just as it does in the vertebrates. This worm has obvious gill openings which are likewise the property of all animals in our own phylum, at least in their embryonic stages. In man, the gill openings form and are reabsorbed as a part of the mysterious growth processes of the embryo, but a rudiment persists as a small bone of our inner ear which is derived from one of the arches supporting those primitive gill openings.

Although the acorn worm has left no fossil record, and would remain unhonored to this day were he not our distant relative, we are as sure it represents that relationship as if we had a series of fossils to verify the fact. For the basic structure and development of such an animal compares too closely with that of our own to be explained otherwise. Let us then not scorn the story of the worms, even though their fossil record is at present meager. We can learn much from them about how life evolved, and about our own beginnings as well as the beginnings of the other dominant group in the world today, the arthropods.

BOOK REVIEW

JUDGING GEMS, by Paul Durand, Hollywood Technicraft Publishers, 1952; 78 pp., $2.00.

Something unusual in technical and handicraft manuals, this soft-cover volume is apparently planographed from text typed in caps and small caps by varitype machine, with lines justified to even the right hand edge. All left hand pages are left blank. The press work is excellent and, although this Style of page is not as easy to read as a page printed from type, it is nevertheless very well done.

The subject matter deals largely with fundamentals, and is presented in two forms, complementing each other. 1) Explanations of the technical details needed to examine a gem stone for quality and workmanship, and 2) a series of brief but informative charts which supply the essential facts in condensed form.

The text is easily readable and clearly understandable, and there are numerous illustrations for further clarification. Many special and adroit methods are described, such as are learned only from professionals who handle, examine and deal with gems constantly. Scientific descriptions are largely reduced to layman language and explained in detail. There is no index which for quicker reference would be of value.

This book promises great help to every gem lover, and gem buyer, who is looking for the pertinent facts he should have.

—J. D. N.

It has been said that the best investment in the world is a one carat diamond—when the loveliest girl in the world is attached to it by the third finger of her left hand.—W

CHAIRMAN, ATTENTION!!

Recommended For Programs

VISUAL AIDS AS PROGRAM FILLERS

Supplying suitable programs for our active club members, month after month, year in and year out, often becomes a perplexing problem for even our most alert Program Chairman.

Someone once said that "a good picture is worth ten thousand words." Be this as it may, there seems to be nothing like a good short up-to-date movie with which to wind up an evening's program. It will often clinch a lot of ideas which the speaker has introduced, and also answer many questions which may come to mind that would otherwise be left unanswered.

An ideal program, for example, might be on the topic of Crystals, a subject everyone is interested in and yet which all too few of us know enough about. The speaker might well elaborate on the idea of crystal growth and crystal structure, and then discuss the crystallographic systems illustrated with models showing the controlling axeses, etc.

This might be followed with a display of real mineral crystals to be exhibited by the various members, upon pre-arrangement, and the program closed with the showing of some movies, listed as follows, all of which may be obtained (rent free) through the courtesy of the Bell Telephone Company.

CRYSTAL CLEAR: Mother Nature's thousand-year job is now done in a matter of months by telephone scientists! See how substitutes for natural quartz are grown in labratory "gardens" Telephone men no longer have to probe tropical lands for quartz—a vital element of modern communications. Fascinating color scenes reveal how tiny "seeds" are grown into large crystal bars. Time, 10 minutes.

VOICE SENTINEL: A scientific curiosity only 30 years ago, the quartz crystal today serves as the controlling heart of the Nation's vast network of telephone and radio. With the aid of animation this film describes the vital role of this miracle-mineral in present day communications. A camera tour of Western Electric's amazing crystal-cutting workshop makes this an excellent subject for schools and technical groups. Time, 16 minutes.

TROUBLE IN SPOTS. An interesting explanation of sun spots and their effect on communications is described in the opening sequence of this informative film. The second sequence shows the precautions taken to prevent fungus growths on telephone poles. This film makes an excellent program filler. Time, 8 minutes.

WESTERN CROSSING: Giant tractor trains push into Western wilderness tracts to complete the first transcontinental telephone cable. From Sacramento to Omaha, ingenious plows make their way through solid rock and heavy bogs, over peaks and through forest. Filmed entirely in color, Western Crossing includes many scenes of picturesque

(Concluded on Page 35)

CEPHALOPODOSIS

1.

"Oh Ceph'lopod, Oh Ceph'lopod,
Come share my home with me!
This afternoon my pickeroon
Has changed your destiny!
I'll wash you free of this debris,
Bring out your wondrous self,
Your curves will grace my crystal case
First on the honor shelf."

2.

I cleaned, I scrubbed, I picked and rubbed,
Its crystalline body shone,
With bits of moss like silken floss,
The 'Pod assumed its throne!
"Oh Nautilus! My Nautilus!"
In reverie mused I,
"Your treasured ghost I treasure most!
I'll love you till I die!"

3.

I viewed the prize thru dreamy eyes,
With visions vague and blurred,
Faint aura filled the air bestilled—
Egad! It moved! It stirred!
Agatized coils in agonized toils,
A pupa working clear
Of its chrysallis case, I bowed my face
In awe—to see—to hear—

4.

"My destiny has changed today?"—
The voice came from the elf—
"No more, you say, I'm common clay?
I'm on the honor shelf?"
I gulped and gasped, my breathing rasped,
"What goes?" I fain would ask,
But didn't dare for fear I'd scare
The voice back in its mask.

5.

"A Ceph'lopod, hand work of God,
As happy as could be,
Jingled, jangled, never wrangled,
Beneath the freshish sea;
Came weary days of swings and sways,
Of weaving to and fro—
"I'll catch some winks; henceforth methinks
I'll take it rather slow."

6.

His sleep was deep, too deep to keep
A rendezvous next day
He could not last, his day was past,
He turned to common clay.
Then one by one, through rain and sun
Each tiny molecule
Made replica with Silica
By pseudomorphic rule.

7.

"Proud conqueror of sea and air
From peaks to shaky fens
You abduct me with wistful glee
Lord Homo Sapiens
'Be permanent' is your intent,
To reign forever more!
The dinosaurs—tyranosaurs—
They sought that goal before."

8.

"So thru the pages of the ages
Each genus, now mere rock,
Was king for a day, then withered away,
By the geologic clock.
That great invention, 'Fourth Dimension'
Your cycle will define;
Time's changeless change so soon will change
Your destiny, not mine!"

B. J. Babbitt

ANSWERS: Test your knowledge.

Check ones which you have answered correctly.

a.—(1) Fossilized vegetal resin, of a clear yellowish-brown color.
b.—(1) The common ore of mercury. A red mercuric sulphide, (HgS).
c.—(1) A thin layer or stringer of coal or other sought-after mineral substance.
d.—(1) A rock, changed or altered from its original form, through the agencies of heat, moisture and/or pressure.
e.—(1) A rock composed of calcium carbonate or silica deposited from solution by perculating ground waters.
f.—(1) Minerals assuming a branched or tree-like formation. Dendrites.
g.—(2) A metallic alloy composed of copper and tin in various proportions.
h.—(2) The weight of a mineral (or rock) as compared with a like volume of pure water.
i.—(2) A common name for calcite in the zinc fields of Wisconsin and Missouri.
j.—(3) A variety of opal (hydrous silica) which occurs as clear forms.
k.—(3) The smallest portion of a compound which yet maintains all of its physical properties.
l.—(3) A pebble of fossil coral commonly found on beaches in the vicinity of Petosky, Michigan.

PROGRAM FILLERS

(Continued from Page 33)

Western landscape. Photographing and music are excellent, making it an ideal subject for all groups. Time, 10 minutes.

THESE ARE TELEPHONE FILMS: All films listed here are availbale to public groups without charge. In each film subject the motion picture camera has gone behind the scenes to record the story of modern communications. The scientific magic of a telephone call across the street—across the country—around the world—is a topic of interest to young and old. Each of these films reveals some part of this fascinating story informatively and interestingly.

HOW TO ARRANGE SHOWINGS: Telephone films, demonstrations and talks can be scheduled by calling your telephone manager. When desirable, arrangements can be made for projection equipment and operation. There is no charge. Arrangements also can be made to loan films for exhibition on your own equipment. All telephone films are 16 mm. sound subjects and cannot be exhibited on silent projectors. Call your local Bell Telephone Company Business Office for further information and scheduling.

Lassen Volcanic National Park in California has two of the Nation's tree "giants" —a red fir (*Abies magnifica*) 25'3" in circumference, 168' tall, and a Mountain hemlock (*Tsuga mertensiana*) 20'10" in circumference, 94' tall.

DETERMINING SPECIFIC GRAVITY

E. Pugh, Downers Grove, Ill.

There are several characteristics by which the identity of a mineral can be determined, and one of the more important is the specific gravity of the sample. The specific gravity, or the ratio of the weight of the sample to the weight of an equal volume of water, can be determined quite readily by weighing with a Jolly balance. This instrument is essentially a sensitive spring balance, arranged to weigh the sample in air, and also when submerged in water.

If we weigh the unknown sample in air, and then when submerged in a separately supported bath of water, the sample will appear to be lighter. This is due to the buoyancy imparted to the sample by the water, and the change in weight represents the weight of water displaced by the sample. If we then divide the weight of the sample in air by the weight of the displaced water, the resulting number is the specific gravity of the mineral. Expressed as an equation,

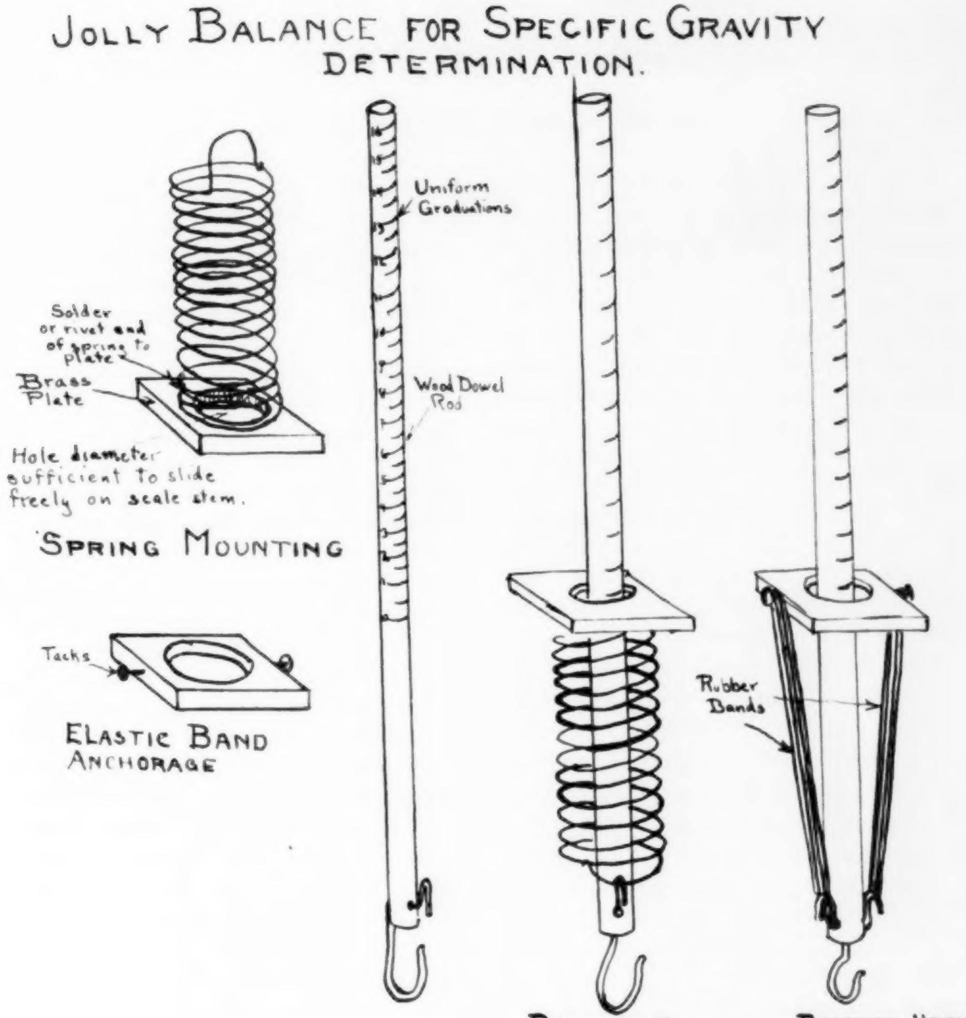
$$\frac{\text{Weight in air}}{(\text{Wt. in air}) - (\text{Wt. in water})} = \text{S.G.}$$

There are a few precautions which must be observed in these determinations. Corrections should be made for the weight and volume of the supporting cord or wire. If a fine wire or a thread is used to support the sample, the volume of the wire or thread will be so small in comparison with the sample in most instances that it may be neglected. If the supporting cord or other auxiliary equipment is weighed first, and its weight subtracted from the sample weights, the resulting figure will be the true sample weight.

It must also be remembered that any impurities or inclusions of dirt, other minerals, or cavities will affect the apparent specific gravity of the sample, for the value obtained by this method is the specific gravity of the entire sample. This method is not directly applicable to samples soluble in water.

Any balance or scale which can be read within 2 or 3 percent of the true weight can be adapted to serve as a Jolly balance. It is also possible to construct a Jolly balance, using materials which are found around the

(Continued on next page)



home, which will give reasonably accurate values. Details of the construction of such a device are shown in the accompanying sketches.

The Basic Lapidary Processes

Polishing—Fourth of a Series

by Wm. J. Bingham, Staff Member

This, the fourth and last article of this series, is on polishing. It is the fastest and simplest of the four basic processes, providing the surface has been properly prepared for polishing. A properly prepared surface is of the desired shape and contour and one on which the scratches are not larger than those left by #500 grit, or preferably finer. Under these conditions an agate (or similar material) surface should be completely polished at a rate of not more than two minutes per square inch. Longer polishing time will result in "over polishing", which is indicated by a wavy or "shark skin" surface and undercutting (digging out of soft areas) will be accentuated.

The operation consists of merely pressing, with a firm pressure, the surface to be polished against the revolving polishing wheel coated with a polishing agent and water, and moving the stone around so that the point of contact travels over the entire surface to be polished.

This brings up the question of just what is a polished surface? The usual definition of a flat polished surface is that it should reflect an incident beam of *parallel* light rays in a *parallel* beam and not cause any scattering of light rays. In other words an image of a lamp, window or other object reflected from the surface into the eye will appear perfectly clear, without blemishes, irregularities, "moonlight on the water effects" or fogginess.

There are two kinds of polished surfaces used in lapidary work, one in which the Bielby layer is developed by an actual flowing of the surface and in which the surface is truly smooth, the roughness being the irreducible molecular irregularities, and secondly the finely ground (scratched) surface which is covered with scratches so fine they are invisible (but still measurable) and it then appears polished.

The machine usually used consists of a horizontal shaft mounted on two ball bearings and having a polishing wheel on each end. The driving pulley is located between the bearings. The wheels are surrounded by a guard or shield and a removable pan is placed under the wheel to catch the polishing agent that drops off, so that it may be used again. A padded arm rest in front of the wheels is a great convenience. The polishing agent is mixed with water in a small bottle or container (about 1 pint size is good) and applied to the wheel with a paint brush. It should have the consistency of cream. Do not mix one agent with another or use more than one agent on a wheel. The speed of wheels should be as fast as possible without throwing the polishing agent off when it is applied. A speed of about 250 to 300 R.P.M. is suitable for 8" wheels.

The requirements for a polishing wheel are that the surface should be porous enough to carry the polishing agent and yet strong enough to withstand the wear involved for a reasonable length of time. Leather and felt are the most satisfactory materials for this purpose. Felt wheels are a solid mass of felt while leather is usually applied to the periphery of a wooden or metal wheel or core. Leathers that are soft or weak or those that get slimy when wet such as chamois or buckskin are not suitable and neither are the very hard types such as sole or belt leathers. The desirable types are those used in making uppers of boots and shoes and in heavy leather jack- etc. The leather is fastened to the core with Duco cement or similar waterproof adhesive. When the leather is worn, it is torn off and replaced, giving a new wheel of the original size. Felt wheels are difficult to true up if they become bumpy or irregular and are continuously wearing down in size.

The polishing agents in use are many and some "secret mixtures" have great claims made for them. For the amateur, three polishing agents are recommended — one each for the two wheels mentioned above, which will take care of all but the most difficult materials, and the third as a last resort process. For one wheel use cerium oxide, which will polish all the quartz minerals, most silicates, opal, calcite, etc. This covers about 99% of the materials polished by the average amateur. On the other wheel use aluminum oxide (levigated alumina) which will polish hematite, spinel, jade, turquoise, malachite, etc. For polishing sapphire or materials containing areas of greatly differing hardness that undercut on the above described wheels and polishes, a hard plastic lap impregnated with diamond powder of less than 5 microns in size should be used. This actually gives a fine grind, but the scratches are invisible and the surface produced appears polished. Since the abrasive in this case is held rigidly in place it cuts all components equally and there is no undercutting. This type of lap is usually mounted on a vertical shaft unit and a small stream of water is allowed to flow across the lap surface.

Tin oxide may be substituted for cerium oxide with almost equal results.

The polishing agent that falls into the pan under the wheels as well as that removed from the stone may be collected and used again, provided that it doesn't become contaminated with abrasive grains or particles of stones. Great care should be used to prevent grit or stone particles getting on the polishing wheels. If this happens, wet the wheel with plenty of clear water and scrape it off with a dull knife or similar edge while it is running. If this doesn't remove the particle and it cannot be found by inspection and removed, the surface of the wheel will have to be removed in the case of the felt wheel or the leather replaced on a leather faced wheel.

* * *

Ed. Note:

This being the last of this series of articles, we would like to hear from you regarding your opinion of these articles and whether you would like a continuing series on lapidary or gemological subjects by Mr. Bingham, together with some suggested subjects.

* * *

At Glacier Bay National Monument, Alaska, all phases of glaciers are represented, from tremendous actively moving ice masses to those that are nearly stagnant and slowly dying. As these glaciers—in reality rivers of ice—flow slowly down the mountains, they are constantly replenished by a succession of westward-moving storms and many of them flow all the way to the sea. There they end in towering cliffs that continually crack off as they become undermined by the water. Some of these cliffs crashing into the sea are as tall as a 25-story building.

OFFICIAL ORGAN OF MIDWEST FEDERATION

"Meet Me in St. Louis"

The 13th Annual Convention of the Midwest Federation held in St. Louis, Missouri on June 26, 27 and 28th was pronounced a fine success by all who attended. This was due, no doubt, to the excellent management and advance planning done by the Committees of the St. Louis Mineral and Gem Society, under whose auspices the show was held, and the efficient leadership and tireless efforts of Convention Chairman, K. E. Gibbons, and his fine staff of lieutenants.

Held in the recreation rooms of the St. Louis University High School, the appointments and lay out for both the dealers and club exhibitors was ideal, and many thanks must be extended to our very genial hosts who served us so graciously.

The formal program got under way promptly on the morning of the first day when Dr. Albert J. Frank, Professor of Geology, St. Louis University gave us a very interesting talk about the geology of the St. Louis Area. We note by the papers that the La Clede Gas Company slipped one over on him just recently by finding oil near St. Louis where they should have found only a sandstone anticline suitable for storing gas.

The afternoon session was opened by a welcoming address given by Professor Carl Miller of St. Louis University High School, which was followed by remarks from the Principal of the school in whose buildings the convention was held. Its history was told very interestingly, and their interest and aims in their future presentation of earth science education was explained. Dr. Ben Hur Wilson followed by outlining the Earth Science Program and courses presented at the Joliet (Ill.) High School, and displayed samples of work done by the students, which proved very interesting and instructive. Many questions were asked following his talk.

Our genial friend John Mihelcic, of the Michigan Mineralogical Society, next showed us a set of excellent slides, and commented in a manner such as only John can do. Ironically many of the pictures dealt with glacial snow and ice, which in view of the outside exhibition being put on by Old Sol at the moment, made them appear even more tantalizing, if possible.

Herbert Grand-Girard, Pres. Midwest Federation of Mineralogical and Geological Societies.

"Bill" Bingham, our lapidary expert next gave us a special talk on lapidary machines and equipment. No one ever dreamed that a dop stick might be so complicated to design, but after Certified Gemologist Bingham explained the mechanics of it everyone could see that just any old dop-stick is a mistake. All who heard his excellent talk came away with many short cuts to a fine cutting and polishing job. The first day's program closed with an auction held in the north end of the exhibit hall, and many fine specimens went at real bargain prices.

The convention reconvened Saturday morning with a talk by Dr. Garrett A. Muilenberg, Assistant State Geologist on the mineral localities of Missouri. We learned that there are a great many more places to collect from than meet the eye while traveling down Route 66 at 70 M.P.H. Following Dr. Muilenberg's talk, Dr. Gilbert Raasch, of the Illinois State Geological Survey spoke on "Leaves of Stone", — a subject dear to his heart. If one has the opportunity and doesn't visit the Braidwood and Coal City strip mines to collect fern fossils after hearing this talk, they should be sorry.

No! All those cars with the red flags attached and assembled just west of the high school weren't fugitives from Senator McCarthy. They were the Saturday field trip cavalcade. First stop was at Pacific where calcite concretions of the St. Peter sandstone stained with Glauconite were picked up along the roadside. We then continued west along U.S. 66 to Stanton and the Rueppfe mine, an abandoned sink-hole iron mine, where some fine specimens were found.

The highlight of the convention was the banquet held Saturday night at the Gatesworth hotel. The banquet was a sell-out and eighteen Midwest clubs were represented. Bet Elmer Headlee who M. C.ed the affair won't forget Mose Austin for a long time. He tangled facetiouly with a

(Concluded on Page 47)

MIDWEST FEDERATION BULLETIN

***Edited by Bernice Wienrank, Club Editor**

Recommended readings selected from Midwest Bulletins.

"Fossiltown, U.S.A.," by Gregory Desmond, July issue of *Rock Rustlers' News.* In the little town of Ekalaha, Montana, dinosaur bones are so common that local ranchers use them for door stops and even the plainest cowboy can toss around such terms as "Tyrannosaurus Rex."

"July and the Ruby," by Dr. Glenn Black, July issue of the *Evansville Newsletter.* The Hindus divided rubies into castes, the ancient Greeks thought of them as having sex—the male being "a more fiery red." Dr. Black reveals these and many other little known beliefs about rubies.

"Radioactivity," by Charles Owens, July issue of *Keystone Newsletter.* An excellent account of the process of atomic disintegration.

"Change Our Name???" by Bob Hagglund, July issue of *Pebbles.* A telling answer to those who would change the well established term "rockhound" to pompous "rockologist."

"A Ledge of Gold," by Emil Mueller, June issue of *Voice.* A ledge of almost pure gold is waiting to be re-discovered in an arroyo near Columbus, New Mexico.

MIDWEST CLUB NEWS

INDEPENDENCE GEM AND MINERAL SOCIETY on May 26 was shown two educational movies on "Artificial Crystals" by Mr. H. Haake of the Southwestern Bell Telephone Company. Examples of synthetic crystals were displayed by member Marie Gordon.

**Societies are urged to send reports of their activities to this department, c/o Bernice Wienrank, 4717 N. Winthrop Ave., Chicago, Illinois.*

MINNESOTA MINERAL CLUB on June 14 met at Little Falls, Minn., for a picnic lunch followed by a trip to a nearby gravel pit where the group picked up many fine agates, including one weighing 7½ pounds.

The classified ad section which the club recently incorporated into its bulletin, Rock Rustlers' News, is proving very popular with the membership.

ST. LOUIS GEM AND MINERAL SOCIETY proved that southern hospitality is no myth when it was host to the Midwest Federation's 30 member societies during the 1953 convention of the Federation. The careful planning of SLG&MS made a success of every phase of the convention, which featured lectures, field trips, exhibits, business meetings and a banquet. An innovation, much appreciated by conventioneers, was the snack bar which was set up and staffed by feminine members of SLG&MS.

CHICAGO ROCKS AND MINERALS SOCIETY has elected the following officers: Helen Cooke, president; Morilla Towne, secretary; and Laverne Thomas, editor. CR&MS is the home organization of Herbert Grand-Girard, the Midwest Federation's newly elected president.

EVANSVILLE LAPIDARY SOCIETY on June 30 viewed a film on "Modern Gem Cutting," shown and commented on by E. E. Cashen of the Linde Air Products Co. Mr. Cashen also displayed a case of beautiful faceted synthetic rubies, sapphires and titanias.

CHICAGO LAPIDARY CLUB will be host to the 1954 Midwest Federation Convention and is already making plans for this important event. Included are a visit to the North Shore Baptist Church to view the Jade Window and a field trip to the world-famed Mazon Creek area for fern fossils.

TOGETHER LET'S GO HUNTING

We will answer your specific inquiries if the desired items are not advertised. Terms: C.O.D. only until credit is established. No shipping charges if prepaid. Money on stock items refunded if they do not meet with satisfaction and they are returned within five days in the same condition they were sent.

FOR THE ROCK HOUNDS

AMETHYST GEODES—$8.50 PER POUND

Fine dark Urguaian specimen with small crystals average weight ½ to ¾ pounds. 10 pound lots **$47.50.**

QUARTZ CRYSTAL—$2.50 PER POUND

Brazilian 2 to 3 inches long, one side terminated clear, 10 pounds **$19.50.**

PRECIOUS GOLDEN TOPAZ—$1.00

Three terminated crystals **$1.00** Larger sizes **$1.00** to **$3.00** each.

EMERALD SPECIMEN

In matrix (Columbian) **$3.00** to **$20.00** each.

CHATHAM EMERALD CRYSTALS

3 to 20 cts., each of interesting crystal formation which you cannot distinguish from real emeralds, **$1.75** per ct. Micromounts, **$3.00** each.

FOR THE LAP HOUNDS

CUTTING ROUGH—85c PER POUND

Tigereye fine banded golden material. Minimum order 6 pounds, average weight ½ to ¾ pounds per piece. Cherry red plus 15%.

AMETHYST—$5.75 PER POUND

Mostly for cabochon Central American material, dark average run 40 to 120 cts. 100 grm **$1.75**, 200 gram **$3.00.**

AVENTURINE—$3.50 PER POUND

Dark emerald green with little or no lamentation. Pieces run from ½ to 1½ pounds. 10 pounds **$27.50.**

TOURMALINE—$15.00 PER POUND

Green and pink vivid colored cabochon material, also watermellon tourmaline. Pieces averaging 8 to 50 cts., 100 gram **$5.00**, 225 gram **$8.75.**

WYOMING JADE—$5.50 PER POUND

Lively mottled green or solid olive green. Chunks run from 3 to 25 pounds. 10 pounds **$45.00**, 25 pounds **$75.00.**

RUTILATED QUARTZ—$3.00 PER POUND

Suitable for sphere cutting nice quality with lots of needles.

SPECIAL OF SPECIAL FOR 2 MONTHS ONLY

½ pound assorted cabochon and faceting quality, assorted amethyst, citrine, pink and green tourmaline, aqua, morganite, beryl, crystal, rutilated crystal, smoky quartz, precious golden topaz, garnet, peridot, all for **$5.50.** ¼ pound **$3.50**, 1 full pound **$9.50.** Pieces average ¼ inch to 2 inches.

FOR THE STONE HOUNDS

LOOK WHAT $1.00 CAN BUY

ANY OF THESE ITEMS AT THE PRICE OF THREE

1 each approximate 2½ ct., step cut perfect aqua, amethyst, topaz (citrine) golden beryl-round brilliant crystal, aquamarine, amethyst garnet, white or blue zircon, approximately 1 ct. size—ring size, tigereye or shell cameo, pair of shell cameo earrings—**scarabs 14x10 oval in** amethyst, citrine, agate, bloodstone, carnelian crystal, etc.—**blue or red miracle star, small** genuine star quartz—green, blue, sard black onyx, goldstone, large cabochon — ematite, onyx, **sard onyx, intaglio—small Wyoming jade,** cabochon—large baroque cabochon in agate or transparent material—**approximately 5 ct.,** step cut synthetic ruby or spinel—large 1½ inch or 3 small Mexican obsidian **Aztec mask—and many** others. **$1.00** each, 4 for **$3.00.**

$5.00 EACH 3 ITEMS FOR $12.50

Small catseye (chrysoberyl), **star sapphire blue** or grey, star ruby **all with sharp star, large 10** ct., golden citrine, or **light amethyst, oval or** octagon, approximately 3 ct., **genuine emerald** cabochon, approximately 1 ct., **genuine kunzite** brilliant cut.

UNUSUAL LARGE GEM STONES

TOPAZ'S BLUE: precious 35x32 mm. Oct, step cut, powder blue, perfect 500 **cts., $2.75** per ct.

AQUAMARINE: dark, blue, green 45x30 mm. perfect, step cut 287 cts., **$8.50 per ct.**

AQUAMARINE: unusual dark Ceylon sapphire color, step cut, with small imperfections 64 cts., **$15.00 per ct.**

MADEIRA TOPAZ (CITRINE): oval, brilliant-step-combination cut, **perfect dark reddish** amber 52x37 mm. 303 cts., **$2.75 per ct.**

CAIRNGORN: heart shape, brilliant cut, very small imperfection, 1280 cts., **50c per ct.**

CAIRNGON: step cut, unusual clear dark heather color, 850 cts., perfect octagon, **60c per** ct.

TOURMARINE: perfect octagon, step cut, "7 up bottle," green 57 cts., 31x16½ mm., octagon **$8.50** per ct.

BLACK OPAL: 20x14 mm., lively dark blue and green 820 cts., perfect **40c** per ct.

DARK GOLD CITRINE: perfect clean 38x20 mm., step cut, octagon, 215 cts., 35x25 mm., brilliant cut oval 117 cts., **$1.75** per ct.

ALMANDINE GARNET: cabochon, oval, 22x15 mm., light color concave back **$175.00.**

"SALMON" TOURMALINE: 17x14 mm., perfect octagon, step cut, 20.40 ct., **$9.50 per ct.**

TOURMALINE "PERIDOT": octagon step cut, perfect peridot color 17x14 mm., 20.10 ct., **$8.50** per ct.

"MEDIRA" CITRINE: heart shape, brilliant cut, 71 cts., perfect, **$3.00** per ct.

"WINE" TOURMALINE: deep wine color 16x11 mm., step cut perfect octagon, **$7.50** per ct.

"PIGEON RED": rubelite set of 3 stones, step cut octagon with imperfection, 1 stone 16x12 mm., 2 stones 12x10 mm., together 29.20 cts., **$12.00** per ct.

OPAL: firey gem oval 47x34 mm. 84 cts., perfect gem dominantly orange and blue, little green and red, **$15.00** per ct.

IMPORTANT NEWS FOR SHOW AND THE CONVENTION VISITORS

Some of these above and many other fine gems will be displayed at the Paterson show. We carry gold mountings to fit your stones.

New England Diamond Corp.

43 WEST 47th STREET
NEW YORK 36, NEW YORK
PLaza 7-0647-8

ROCHESTER EARTH SCIENCE SOCIETY gave a demonstration of the art of gem cutting at the Rochester Art Festival, held June 6. Information sheets about RESS were handed out to many interested persons who were eager to know more about the club and its hobby.

RESS has elected the following officers for 1953-54: Harold Whiting, president; Dr. Harry Woltman, vice president; Margaret Rogers, secretary.

YE OLD TIMERS' CLUB has re-elected Earl Van Deventer as president for another two-year term. The age limit for membership in YOTC has now been officially lowered to 50 years. The previous limit was 60. It is hoped that with this change the membership will soon reach 1000.

EVERETT ROCK AND GEM CLUB on July 18 enjoyed a combination picnic and field trip. The group has coined the term "Gemboree" for these fun-packed get-togethers.

BLUE MOUNTAIN GEM CLUB during a recent sojourn at Whitney, Oregon, excavated several huge logs in various stages of petrification. Many opalized pieces were found.

BMGC presently is preparing a group of rare and unusual minerals for display at the La Grande (Ore.) public library.

MINERALOGICAL SOCIETY OF PENNSYLVANIA on June 14 toured the Cornwell Mines of the Bethlehem Steel Corporation. 183 members and guests turned out for the occasion. From the mines' ore dumps the group picked up pyrite, chrysocolla, lodestone, magnetite, bright red hematite, malachite and byssolite.

THE FORT RANDALL GEMITES held their regular meeting and election of officers on 23 July, 1953. Officers are as follows:

President, Edgar Wright; V. President, A. W. Burling; Sec.-Treas., Earl Cover; Librarian, Leonard Hammer.

The program was presented by Earl Cover, who spoke on the subject "The Techniques Employed in Laying Out and Shaping the Stones to Retain the Pattern and Quality." He also explained the method of pitch polishing and the use of the Draper Machine for lap grinding and polishing.

EARTH SCIENCE CLUB OF NORTHERN ILLINOIS reports that members of the archeological branch have undertaken an ambitious project this summer. They have had the privilege of investigating an Indian site near Chicago for the Chicago Museum of Natural History, under the direction of Miss Elaine Bluhm, a staff member of the museum, and Mr. David Wenner, formerly with the Smithsonian Institute. This project has given them the opportunity to use some of the knowledge gained during two years of theoretical work by the group.

The September meeting of "Esconi" will feature "Brag" night—the night when all good Esconi's bring their summer finds for all to admire. The program will be given by four club members.

CLASSIFIED ADVERTISING

Rate: Six Cents per word, per issue. Minimum, $1.00, payable in advance. No proofs or copies for checking are furnished. Introductory words will appear in CAPITALS. When additional capitalization is required, each such word counts as two words.

QUARTZ CRYSTALS. Unusual Canadian specimens. On approval. CLAUDE D. SMITH, Box 291, Geneva, N. Y.

SPECTROSCOPE for quick ore and mineral identification. Postpaid $3.00. CUTTING TECH CO., Los Altos, Calif.

U. S. GEOLOGICAL SURVEY BULLETINS, other publications, back numbers bought and sold. Also files of periodicals. J. S. CANNER & Co., Inc., Boston 19, Mass.

ASSORTED GEM SLABS $3.00 lb. plus postage. ART OF GEM CUTTING, AGATE BOOK, LAKE SUPERIOR AGATES $2.00 each postpaid. Price list on request. KEWEENAW AGATE SHOP, Ahmeek, Mich.

DENDRITIC OPAL (Kansas), good polishing stone, only $1.25 a pound. HASTINGS TYPEWRITER CO., Hastings, Nebr.

TONOPAH, NEVADA, is where C. C. BOAK lives, with his outstanding, scientific, world-wide collection of MINERALS, GEM and SEMI-GEMSTONE species—CRYSTAL groups, ROCK PICTURES etc. Visitors welcome. C. C. BOAK, 511 Ellis St., Tonopah, Nevada.

WANTED—Carved cameo portraits of known persons. Send description, size, material, price. WILLEMS, Box 1515, Chicago 90.

GENUINE SYNTHETIC STONES accumulated from our vast gold-buying. Approval shipments sent collectors upon request. Advise your needs. B. LOWE, Holland Bldg., St. Louis 1, Mo.

BOOKS FOR COLLECTORS AND LAPIDARIES—Gem Trail Journal for your field trips, $2.00; Indian Silversmithing, an excellent work for lapidaries, $4.75; Dake's Gem Cutting, $2.00; English's Getting Acquainted With Minerals, $5.00; Dana-Hurlbut's Minerals and How to Study Them, $3.90. Ask for other titles. PAUL VANDEREIKE, Route 2, Box 1168, Vista, Calif.

BARGAIN JEWELER'S 4X EYE-LOUPE, frees hands for examining minerals, etc., $2.50 value, $1.25. ANELAG, Box 141ES, Rochester, Wis.

A DOLLAR BRINGS choice of FIVE Apache Tears ("Smoky Topaz"), or concretions and geodes, or chalcedony roses, or Fluorite crystals or marcasite concretions, or petrified wood assorted—postpaid. Write for price list of minerals, books, and lapidary equipment. GRITZNER'S MINERALS, Mesa, Ariz.

WILL SWAP fine Colorado petrified and agatized wood for lapidary equipment and supplies; assorted colors; sizes from 1/4 pound to one ton. JAMES SCHERMERHORN, Castle Rock, Colo.

LODESTONE—MAGNETIC ROCK MINERal (Magnetite). Uses and interesting legendary folklore, story and superstitions with each order. $1.00 postpaid for supercharged piece of ore approximately 1 pound. Write for prices on larger quantities. OLMSTEAD MANUFACTURING CO., Dept. 6, 116 E. Markham, Little Rock, Ark.

PONY BUTTE THUNDEREGGS from the original Priday Ranch in Central Oregon. $1.25 per pound, 5 pounds $5.00. HASTINGS TYPEWRITER CO., Hastings, Nebr.

ALMANDITE GARNETS, perfect dodecahedrons and dodecahedron—trapezahedrons, 3/8ths inch to 3 inches. Send 25¢ for specimen and price list. P. POTAPOFF, Falcolnbridge, Ontario, Canada.

WANTED—Will pay $1.00 each for copies of Earth Science Digest of August 1946, September 1946, March 1947; 50¢ each for October 1946, and December 1946; Sept.-Oct. 1947; and January 1949. EARTH SCIENCE DIGEST, Box 1357, Chicago 90.

MINERAL COLLECTION FOR SALE. 200 Specimens, some fossils and fluorescents, $50.00. GUILD, 630 Greenleaf Ave., Wilmette, Ill.

A MINERAL COLLECTOR'S GUIDE TO WYOMING, 25¢. GRITZNER'S MINERALS, Mesa, Ariz.

FOSSILS — Belemites, Pachyteuthis Densus, 3 for $1.00. Mollusca; Gryphaea Mucronta, 3 for $1.00. No orders under $1.00. Postpaid in U. S. DON KNOWLES, 3906 Canal, Grandville, Mich.

GENUINE STAR SAPPHIRES, $1.00 per carat and up. We do all kinds of jewelry repair work, sizing, mounting, etc. B. LOWE, Holland Building, St. Louis 1, Mo.

COLOR SLIDE BARGAIN. Send 50¢ and receive our 25¢ catalog of over 1000 mineral slides arranged by groups, and a beautiful 50¢ slide for projection, plus a 25¢ credit slip. Geology list also available. 4000 Nature slides in stock. Programs rented. Details free. SCOTT LEWIS, 2500 Beachwood, Hollywood 28, Calif.

(Continued from Page 41)

Texas Longhorn from Austin to the great amusement of the happy diners.

Sunday morning, early, but not too bright, the final business meeting was held at which time the new officers for the coming year were voted into office. Those elected to serve were, Herbert Grand-Girard, President; William Bay, Vice President; Mrs. Oriol Grand-Girard, Secretary; Marjorie A. Scanlon, Treasurer and Dr. Ben Hur Wilson, Historian. The invitation of the Chicago Lapidary Club to hold the 1954 convention in Chicago was accepted.

There were so many fine exhibits, both commercial and non-commercial that to list them or attempt to describe them would take more space than we have available. Three days were much too short to see and fully appreciate all the excellent displays. All in all it was a really great convention and gives us something to shoot at in 1954.

Last but not least the booklet of maps on suggested local field trips published by our host, the St. Louis Mineral and Gem Society was a great idea. Hope it is emulated in the future.

The Great Smoky Mountains, in North Carolina and Tennessee, represent one of the oldest uplands on earth, and they are the highest mountains in the United States east of the Black Hills. An impressive portion of the "Great Smokies" is included in Great Smoky Mountains National Park. The Smokies region has long been regarded by botanists as the cradle of the present vegetation of eastern America.

* * *

The Colorado River, at the bottom of the mile-high Grand Canyon, in the national park of that name in Arizona, lies at an elevation of more than 2,900 feet above the sea. The river carries nearly a million tons of sand and silt past a given point in the park every 24 hours.

IMPORTANT BERYLLIUM DEPOSITS IN MAINE

Maine boasts of the "largest known" beryllium deposit, located on property of the Bumpus Mine at Oxford, now owned by the United Feldspar and Minerals Corporation, a subsidiary of the American Encaustic Tiling Company of Pennsylvania.

Beryllium, once commonly called glucinum on account of the sweetish taste of many of its salts, is a rare, silvery-white metal now being used extensively in the manufacture of certain alloys and is in big demand in the national defense program. Until recently, however, as a metal, it had but few uses.

Except for beryl, an aluminum silicate, its minerals are rare. This mineral (beryl) when free from flaws and enclosures, and of good color can be used as a gem. As the emerald it has a value exceeding that of the diamond and second only to the ruby. Aquamarine and golden beryl are also the same species.

It was quarried for emeralds on the west coast of the Red Sea by the Egyptians at least 1650 B. C., and the Spanish conquistadors found fine emeralds in both Mexico and Peru. Crude beryls are found in many locations throughout the United States; in New England, at Acworth and Grafton, New Hampshire, at Royalton and other points in Massachusetts, at numerous places in Maine as well as in North Carolina, Colorado and South Dakota. It possesses hexagonal crystal habits and makes very attractive cabinet specimens. A representative group should be in every good collection. —B. H. W.

"Detroit's Salt Cellar," ***by W. L.*** **Dever. In DuPont Magazine, April-May, 1952, Vol. 46, No. 2, pp. 32-33.**

An account of the International Salt company's rock salt mine under the outskirts of Detroit, and how salt is mined. Well illustrated.

GOVERNMENT REPORTS OF UNUSUAL INTEREST

No. 40 Land of the Free U. S. Geological Survey

Secretary of the Interior Oscar L. Chapman recently announced the publication of LAND OF THE FREE, number 40 in a series of conservation bulletins. The booklet is designed to aid in the improvement of individual and community practices in the wise use and conservation of our natural resources . . . particularly through understanding the management and conservation activities of the Bureau of Land Management.

* * * *

Uranium bearing ore deposits in the Carrizo Mountains Area, Navajo Indian Reservation, Apache County, Arizona, and San Juan County, New Mexico, consisting of sandstone impregnated with carnotite and a vanadium-bearing mica, have been studied by W. L. Stokes, geologist, of the Geological Survey. Intrusive igneous rocks make up most of the mountain mass, he states, with the ore turning up in Mesozoic sedimentary rocks exposed on its flanks. These deposits yieled about 22,000 tons of ore between May 1942 and February 1944. The report is contained in Circular III, available free on application to the Geological Survey, Washington 25, D. C.

* * * *

"Volcanoes of Hawaii National Park", an Informative publication written by Dr. Gordon A. MacDonald, volcanologist in charge, Hawaiian Volcano Observatory, U. S. Geological Survey, and Douglas H. Hubbard, Naturalist, Hawaii National Park, has been published by the Hawaii Natural History Association, Hawaii National Park, Hawaii. Copy of this well-illustrated publication may be obtained from the Association for 50 cents.

* * * *

A discussion of water law with special attention to ground water law viewed from the standpoint of the hydrologist was prepared by C. L. McGuinness of the Geological Survey, Department of the Interior, at the request of the President's Water Resources Policy Commission. A limited number of copies are available free on application to the Geological Survey, Washington 25, D. C.

U. S. BUREAU of MINES

Laboratory tests by the Bureau of Mines show zinc, copper, and lead can be recovered by beneficiation from the massive pyrrhotite ore of the Great Gossan Lead—a mineralized structure extending for 17 miles across Carroll County, Va.—according to a report released recently by Secretary of the Interior Douglas McKay. This ore had been mined only for its sulfur and iron content.

Prepared by James S. Browning and Clinton B. Clevenger, Bureau metallurgist and chemist, respectively, at Raleigh, N. C., the report describes small-scale preliminary studies.

Recovery of zinc, copper and lead, associated with certain pyrrhotite (iron-sulfide) bodies, could augment the Nation's domestic supply of these strategic metals — a large proportion of which is now imported.

A major obstacle encountered in beneficiating the Great Gossan material by ore-dressing methods was the difficulty of obtaining strictly comparative tests due to the rapid oxidation of the ores. It was necessary to grind the ore fine enough to pass through a screen with 270 holes to the inch.

It was found that calcined concentrates leached with dilute sulfuric acid solutions and ferric chloride-brine solutions yielded 85 percent of the total zinc, 85 to 89 percent of the total copper, and 95 percent of the total lead.

A free copy of Report of Investigations 4945, "Processes for Beneficiating Great Gossan Lead Ores, Carroll County, Va.," may be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa.